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ALUMNI BULLETIN

SUMMER 1990

The Environment Issue

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Cover: A smog-filled summer day in Los Angeles. © 1990 by Frank S. Balthis.

INSIDE H.M.A.B.

This issue is about the environment. Many years ago, Harvard had a most distinguished professor of biology—William Morton Wheeler—a man, it has been said, who could have kept up his end of a conversation with Aristotle. True to Harvard tradition, Wheeler knew a great deal about ants. The citation of his honorary degree reads: "Profound student of the social life of insects, who has shown that they also can maintain complex communities without the use of reason." When it comes to the environment, it seems that the ants are well ahead.

Jennifer Leaning leads the way with a definition of a physician's environmental as well as social responsibility. Sarah Jane Nelson's profile of Edgar Wayburn '30, who was a leading figure in the Sierra Club, follows. Ellen Barlow leads us out of a London fog into the sparkling world of photochemistry and acid aerosols. David Roe, son of a very articulate fellow alumnus, '43A, takes precious time from his busy schedule as attorney for the Environmental Defense Fund to emphasize the need for economic incentive to protect the world we live in. (You set a computer to catch a computer.) Then John Remensnyder '57, takes us to the USSR with a first-hand account of an environmental catastrophe in the Ural Mountains, and its cost in human terms.

We reprint a piece from Alice Hamilton's classic *Exploring the Dangerous Trades* to introduce Philip Landrigan's '67 account of today's workplace. Of topical interest is our correspondence with Andrew Embick '77, now an Alaskan physician in the two-physician Valdez Medical Clinic, suddenly inundated by 14,000 people cleaning up the mess—a study in scale.

So as to end on an upbeat note, we close with a friendly discourse by Gil Sanchez '49 of our editorial board, on the humane contributions of that eminent physician, Josef-Ignace Guillotin, to the democratic environment.

—Gordon Scannell

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ALUMNI COUNCIL: PRESIDENT'S REPORT

Council Curriculum

by Claire Stiles

The winter meeting of the Alumni Council, held late in January, was once again highlighted by progress reports on the current survey of physician attitudes toward medicine. Langdon Burwell '44, chairman of the survey committee, reported that within three weeks of the initial mailing more than 25 percent of the questionnaires had been completed and returned. This was felt to be an extraordinarily early response in view of the busy lives we all lead.

It was expected that the returns would be completed during the spring, and the selected telephone interviews would be conducted. However, since results on major projects always seem to take longer than originally hoped, the final survey statistics will be com-

pleted and included in the national symposium, still planned for the spring of next academic year. We should have more definitive news for you on the symposium after the spring council meeting.

Edward Kravitz, MD, professor of neurobiology at HMS, presented to the council some exciting ideas for the celebration of the 20th anniversary of affirmative action at Harvard Medical School. Scheduled for June 6 during Alumni Week, the program will include a review of past accomplishments and the future outlook for minority graduates, as well as issues in minority medicine as a whole. It is hoped that many alumni will be able to attend.

Financing a medical education is

an increasingly difficult problem in these times of escalating costs. Many students graduate with extremely high loans and debts to repay, some exceeding \$100,000. This could have far-reaching effects on who chooses medicine as a career and what fields they enter on graduation. Paula Johnson '85 gave a brief report on models of creative financing for graduate education in general. The council felt that this was an extremely important issue that needs to be addressed. Therefore, a committee to explore ways to finance graduate medical education was formed, and will be chaired by Nancy Rigotti '78. We will keep you informed of the progress.

As a final note, the centenary of

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the Harvard Medical School Alumni Association was discussed. A decision was made to hold centennial events between November 1990, one hundred years after the formation of the association, and June 1991, the anniversary of the association's first meeting. Nina Tolkoﬀ-Rubin '68 is chairing a centenary celebration committee, and will report at the spring meeting.

There are many exciting and inter-

esting events being planned for Alumni Week in June 1990. On behalf of the Alumni Council, I would like to invite all of you to attend, and hope to see you there. □

Claire Stiles '56 is professor of clinical anesthesiology at the University of Southern California School of Medicine and teaches anesthesia at the Rancho Los Amigos Medical Center.

LETTERS

Religion Issued Praised

I read the Winter issue of the *Alumni Bulletin* last night and I liked the religious articles. I liked to see them there and liked what was in them. I enjoyed the reflections of Lee Schwamm. Other reflections would be interesting. Why not print more? I also liked Bob Cole's article.

—Karl Menninger '17

Thank you for including the photograph of His Holiness the Dalai Lama in the Winter '90 issue of the *Bulletin*. I will send His Holiness the *Bulletin*.

How outstanding it is that you have covered religion in the comprehensive way you did ("Religion and Medicine," Winter '90). I feel it is important that physicians be aware of their own religious inclinations, howsoever they choose to label them. All the articles were outstanding.

I found Carola Eisenberg's review of the religious/spiritual/humanistic life of students at the medical school particularly inspirational since it showed both the depth of the students' interest as well as the caring, sensitive way she approaches the interests of these students.

—Albert Crum '57

I have just finished reading the Winter 1990 issue of the *Bulletin*. It is a tremendous issue with a most timely sub-

ject—doctor-patient relationship plus religion and medicine. As usual, the *Bulletin* does a masterly coverage of the issues.

Congratulations. I'm proud of Harvard and especially of its new concepts of medical education.

—J. Vincent Arey '46

I was very pleased and moved by the "Religion and Medicine" issue of the *Alumni Bulletin* (Winter '90). Many references were made to Francis W. Peabody and his writings about the care of the patient. My introduction to Harvard Medical School was a class meeting in which Herman Blumgart laid forth his philosophy of medical care. The central point of his presentation was Peabody's "The Care of the Patient." These philosophies and teachings were reiterated many times during our medical school years, but they somehow got lost in the many minute details of pre-clinical and clinical curriculum materials. Nonetheless, caring for patients was implanted into my subconscious.

As I entered the practice of medicine, I rapidly became aware of an aspect of patient care that can best be described as the Numinous (a term coined by Carl Jung). Many phenomena in medicine are not explained, are unexplainable, and are mysterious. There are, furthermore, many medical situations in which there are not ready solutions. This is an area of medical care that cannot be addressed by the logical curriculum materials usually

presented to medical students. Opportunities to study literature in medicine, philosophy of medicine, sociology and anthropology, etc. would better round out the curriculum.

My own career has been marked by a gradual progression into areas where religion and medicine come together. This finally culminated in my returning to school, yet again, and obtaining a master's degree in religion at Iliff School of Theology in Denver, Colorado. My focus there was on medical ethics. Once again, the situations found in medical ethics are best understood as dilemmas to which there are no easy solutions.

During the last half of my medical career, I have been very interested in the integration of body, mind and spirit. I am currently engaged in high-level wellness care, and my particular interest is in exploring the nature of spirit within myself and with my patients. I encourage my patients to find their own path toward wholeness/healing. My prayer is that patients may find the Wellness Center a caring, safe place for them to express their pain and "disease." Thus, I come full circle to Peabody's statement that, "The secret of the care of the patient is in caring for the patient."

—Thomas C. Washburn '57

I write on behalf of the Massachusetts Chaplains Association to thank you for the Winter 1990 issue of the *Bulletin*. Our gratitude applies significantly to your decision to follow a hunch, pursue it carefully and present a very stimulating array of viewpoints on the relations between religion and medicine. The opportunity to hear from several generations—from Peabody to Schwamm and Sinha—and the candor of the participants in the conversation, and of Robert Coles, are both unusual. The *Bulletin's* layout and illustrations add much to the richness of the copy.

Most of MCA's members, whether lay or ordained, practice their craft within health care institutions eager to maintain and expand the scientific approach to health. Some of us are occasionally brushed aside by medical staff, but more and more we find physicians, nurses and other hospital personnel talking about approaching the patient as a whole person. The increasing use of multidisciplinary care teams, which sometimes include a chaplain, reflects this integration.

At the same time, theologians and local pastors are rediscovering within Christian and Jewish traditions a reli-

gious anthropology that sees human beings as carefully woven unities of body, mind and spirit. It is no longer rare to find in mainline churches and temples healing services and groups that encourage both use of scientific medicine and traditional rituals of prayer, touch, meditation and anointing.

The Parish Nurse program, already active in parts of the Midwest, is spreading along the East Coast as well. This program brings a professional nurse onto the staff of a church or group of churches to provide education, health screenings and referrals for church and community members. Such nurses can provide some of the listening time and human sympathy made impossible by the pressures on today's physicians.

The Massachusetts Chaplain's Association is greatly encouraged by your interest in this particular "no man's land" and looks forward to future encounters in it. Perhaps it's time for another Doctor-Clergy Dinner.

—Stephen J.G. Pepper
Secretary;
Massachusetts Chaplains Association

Remembering Otto Folin

The review of the biography of Otto Folin ("Otto Folin: America's First Biochemist," Winter '90) reminded me of two amusing episodes that could not have been included in Dr. Meite's book.

My first year at medical school corresponded to the first year of Vanderbilt Hall. Members of the faculty used to join students at the tables at lunch, giving us a certain feeling of belonging. One day, fairly early in the first semester, one of the upperclassmen asked me how I liked medical school. After four years of concentration in pure science, I had already found the clinical approach of the preclinical sciences rather dull and uninteresting. As a result I replied, "So far, what I've seen of medical school makes me want to become a mechanic."

Dr. Folin was sitting at the same table and remarked, "Why is it all you young students want to become surgeons?" Of course, this lack of regard for the surgical profession was undoubtedly based on the fact that some surgeon had severed his left facial nerve in the course of a procedure, probably on a parotid tumor.

The second incident occurred later in the freshman year when some of us were seated at the table with Dr. Folin and C. Macfie Campbell, professor of psychiatry, who was a very enthusiastic classicist. The two professors were en-

gaged in an argument regarding the value of a classical education. Each time Campbell would back Folin into a corner, the latter gentleman would change the subject. Finally, Campbell said, "Otto Folin, you are a scoundrel"; thereupon Folin turned to the students and said, "Don't pay any attention to him, all he knows is crazy people."

Even now, approaching the 60th reunion of my HMS class, I have vivid memories of many inspiring teachers, but none more vivid than that of Otto Folin.

—Theodore B. Massell '31

Williams's Ophthalmic Connections

In the *Bulletin's* Spring '90 issue, Reginald Greene recounts the historic contributions of Boston's Francis H. Williams to diagnostic radiology ("Francis Williams and the Roentgen Ray: The Seeds of Radiology"). I would like to add the role played by Williams's brother, C.H. Williams, for the first use of roentgenography in detecting and removing intraocular foreign bodies.

The Williams brothers were the sons of Henry Willard Williams, the first professor of ophthalmology at the Harvard Medical School, and the one for whom the current Williams professorship is named. Francis began practice as an internist, whereas C.H. became an ophthalmologist.

The key patient was a 17-year-old boy, who was struck in the eye by a missile from an exploding cartridge that he was hammering. The date was June 5, 1896; just six months after Roentgen's epochal discovery.

C.H. was unable to visualize the interior of the eye because of massive

intraocular hemorrhage. A magnet was without effect. The cornea was lacerated, suggesting a wound of entry, but no gross evidence of the suspected foreign body was seen.

C.H. consulted his brother and, together with Charles L. Norton from MIT, the three explored the possibility of visualizing a small, metallic object, first on themselves; or rather, on Norton. Specifically, a chip of copper, the size of what might be expected within the eye, was placed on Norton's eyelid for a 10-minute exposure from the emanation of a modified Crooke's tube. The experiment confirmed the feasibility of the method.

The patient was similarly exposed with the tube placed close to the temple. The procedure did indeed show a foreign body in the eye—a thin piece of copper measuring one-fourth inch long and one-eighth inch wide—which C.H. then removed. A new era of ophthalmic traumatology was born.

The case was described the following month at the July meeting of the American Ophthalmological Society, and published in the August 13, 1896 issue of the *Boston Medical and Surgical Journal*. The title is long enough to have served as an abstract: "A Case of Extraction of a Bit of Copper from the Vitreous where Xrays helped to locate the Metal."

The cornea was said to have healed well by two weeks after the accident, and the eye, though blind, showed little inflammatory reaction. But alas, within one month the patient suffered another injury to the eye, this time with a piece of wire, and the eye was enucleated. Nevertheless, the case represents a historical landmark for ophthalmology, if not for the patient, and a precedent for promptness of publication.

—David Cogan '32







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On a closer inspection of HMA Bulletin

Not attempting to compete
With Felicia Lamport
In dealing with issues
Of grave and national import,
May I, without appearing
To you querulous,
Remark that on page 10 (Spring, 1990)
There appears what I cannot
Resist referring to as
A Siege Perilous?

Did they never at your
Secondary place of learning
or even later in the nearby
Groves of Academe
Tell you that things are seldom
or hardly ever
What they seem, especially in
Our rich and etymologic English
tongue?
"I before E, except after C," is
What they should've brung
To your attention, *or*
What you should have heard;
Although to blame the Editor-in-Chief
For misprints or misprisions
Is absurd.
Herewith a classic tag to end this
verbal rarebit:
"*Forsan, et haec olim meminisse
juvabit*—"
I know you'll take my scolding like
a man.
Hilariously yours, your Aunt
(the Pythoness)
In Yucatan.

—Jane Hamlin Bragdon

Editor's reply:

This arcane cautionary verse, with its oblique reference to Hilaire Belloc, was referred to an erstwhile schoolmate of the Pythoness. She offered some simple rules and few:

I before E
Except after C,
Or when sounded as A
As in neighbor and weigh.
(Exceptions: neither,
leisured, foreigner seized
the weird heights.)

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PULSE

Something Old, Something New

A "big dig" on Longwood Avenue is unearthing more than dirt and noise. A 300-space parking garage is being built *under* the Harvard Medical School Quadrangle. And after the garage is finished, the Quad will be restored to its grandeur when first landscaped nearly a hundred years ago.

While the creation of desperately needed parking spaces may be more immediately appreciated, the underground garage is providing an opportunity to spruce up the area above ground as well. The Quad, as designed in 1908 by the renowned Olmsted Brothers landscapers, who also designed Boston's Emerald Necklace, has suffered over the years from the wear and tear of picnickers and squirrels.

Working from the Olmsted's original blueprints and design plans, Marion Presley, of the Boston landscaping firm Presley and Associates, says they will

try to achieve the Olmsteds' ideas of "total symmetry." Plans include sinking the courtyard, adding two rows of benches, and integrating small evergreens and junipers in symmetrical lines.

The old Japanese lilacs in the middle of the courtyard will be replaced with young ones, and the original groundcovers, such as vinca and candytuft, will be re-introduced. The only difference in plans for the modern Quadrangle is the creation of structures allowing handicap accessibility.



Work crews dig up the Quadrangle to build an underground parking garage. When finished, the Quad will be restored to its original landscaping as shown in this 1921 illustration.



The project did not interfere with graduation celebrations. Although construction began in March, it stopped on May 31 and a sod covering replaced the mounds of dirt. Construction will continue until May 1991, at which time the entire project will be finished. Commencement in 1991 should look, at least from an aerial view, much as it did in 1908. □

Exhibition Focuses on HMS African-Americans

An exhibition entitled "The Afro-American Presence in Medicine 1850-1930: The Harvard Connection" was on view at the university's Widener Library during the month of February. Doris Y. Wilkinson, PhD, MPH and a professor of medical sociology at the University of Kentucky, assembled the exhibition, which was co-sponsored by the W.E.B. DuBois Institute for Afro-American Research and Widener Library.

The exhibition explored the lives of African-American medical students at HMS during the tumultuous years before affirmative action—covering the Civil War, the Emancipation Proclamation, World War I and the Depression.

Wilkinson, who organized the exhibition while she was a visiting scholar/Ford Foundation Fellow, mounted a similar one in Kentucky, which featured early black physicians from that area. The idea began after she happened upon a history of successful African-Americans in a Kentucky antique store. The anthology included a surprising number of physicians. "They were actual MDs," says Wilkinson, "not self-taught healers or apprentices studying under preceptors."

Among the items on display in the Harvard exhibition were the original letters of admission to the first three black students to attend the medical school. Daniel Lang, Isaac H. Snowden and Martin Delaney were admitted to HMS in 1850, yet were dismissed one semester later following some students' letters of protestation, also included in the exhibition, to Dean Oliver Wendell Holmes.

Well-known African-American alumni William Augustus Hinton '12 and Louis Tompkins Wright '15 were presented through short biographies and photographs, as were photographs and writings of the first African-American to graduate from HMS, Edwin Clarence Joseph Turpin Howard, Class of 1869. Howard was followed in 1871 by James Still, who went on to become a spokesperson for civil rights and the



James Q. Thimble, Class of 1906 (left) and Toussaint T. Tildon, Class of 1923 were both included in an exhibition focusing on African-American alumni from 1850-1930.

first African-American to be elected to the Boston School Board.

Still's activism mirrored a prevalent attitude in the majority of these early physicians, argues Wilkinson: "They were outspoken critics of segregation, discrimination and Jim Crow," she says. "In a sense, they predate today's concept of 'physicians for social responsibility' because they were *already* responsible for their communities, not just their families." □

Conflicts of Interest Defined

New guidelines that define potential conflicts of interest inherent in industry-university relationships have been adopted by Harvard Medical School and its affiliated institutions. Since the university has been fostering the development of such relationships, it was the dean's intention that HMS faculty have guidelines to help them structure arrangements with industry that would maintain academic integrity. In the past, disclosures of potential conflicts have been voluntary.

The guidelines, hammered out over a year's time by the Committee on Conflict of Interest and Commitment, establish three categories of activity for faculty: those that require special attention and specific approval, those permitted with oversight procedures, and those routinely allowable. Annual disclosure of financial relationships between faculty and industry are now mandatory, and a committee will be appointed to review disclosed activities

and implement procedures for oversight.

"After much discussion and a tremendous amount of input from the faculty at large, I think we have a document that addresses the concerns the dean raised," says the chairperson of the committee, Barbara McNeil '66, who is HMS professor and chairman of Health Care Policy.

Forgive Us Our Debts

An amnesty day of sorts is being offered to students who have defaulted on their federally-guaranteed student loans.

The Omnibus Budget Reconciliation Act of 1989 authorized this "special payoff program." GSL borrowers may forego paying a penalty if they contact the guarantee agency holding their loan and arrange a full repayment before August 31, 1990.

Under this limited-time offer, payment in full of principal and interest due on defaulted loans will save borrowers not only the cost of penalties, but also administrative charges and collection fees—added costs that can total up to 35 percent of the debt. Approximately 2.5 million borrowers are currently in default on \$6.8 billion in student loans.

For more information, call the Federal Student Financial Aid Information Center at 1-800-333-4636. □

"Much discussion" may well be an understatement. As Dean Tosteson reported to the Alumni Council in January, the faculty meeting at which the proposed guidelines were first discussed was "the kind of meeting that gave me increased respect for the Founding Fathers."

Though Harvard Medical School is among only a few schools to adopt such explicit guidelines, there has also been a great deal of debate at other universities and even in Congress about whether and how to guard against academic conflicts of interest.

There are several key points of the HMS guidelines. For example, only with "special attention and specific approval": can a faculty member participate in a clinical trial while simultaneously serving as a consultant to a company whose product is being evaluated; receive research support from a business in which the faculty member holds equity; make referrals to a private laboratory owned by a full-time member of the faculty; or present research results without disclosing financial interests in a company whose product is the subject of research.

With oversight, the following activities are permitted: participating in a clinical trial on a technology invented by the faculty member; assigning post-docs to projects sponsored by a business in which the faculty member holds equity or a consulting position; and serving on the board of a business from which the faculty member receives research support.

To receive royalties or honoraria requires neither approval or oversight.

□

Second Year Show Puts HMS on Trial

The New Pathway stood trial as "Absence of Malleus," this year's second year show, explored the highways and byways, the ups and downs, and trials and tribulations of life at Harvard Medical School.

The courtroom drama began when student Brett Taylor—bemoaning his lack of sleep, free time and money—decided to take the New Pathway to court for gross negligence. Judge Tim Jenkins heard the evidence as students rushed to center stage to tell, or sing, or rap, or dance their story of life at HMS.

Goody-two-shoes Ute Lohrmann testified on behalf of the school, singing to the tune of "I Am Sixteen": "I'm a first year/Happy to be here/Harvard



The second year show had students contemplating their Constitutional rights, or at least their chances in court, as "Absence of Malleus" took to the stage. Hot tunes included "Med School Nights" and "Harvard Dorm of Horrors," and an historic look at the tutorial process provided an educational perspective.



was my first pick./I'm so excited/Folks are delighted/I want to heal the sick." But just as the judge was thinking medical school wasn't such a horrible place to be, third-year Liz Miller took a break in her rotations to add her testimony:

"I'm a third year/I could use a beer/I'm just another cog./ No social life/It's too high a price/I should have studied law."

So that Judge Jenkins could study the evidence surrounding the efficacy of the tutorial process, the plaintiffs



staged "Tutorial Through the Ages/The Tutorial Process." The jury learned that even the Romans used tutorials to make diagnoses as Samir Shah, Rob Lowe, Aaron Deykin and Debbie Haley discussed whether a patient's illness was the result of natural causes or the wrath of Zeus. In medieval England, tutorial members Daniella Duke, David Kieff, Ben Stranger and Mary Ann Hopkins debated the differential diagnoses of illness caused by witchcraft or sin.

In modern times at HMS, Betty Sinh thought the best way to begin the tutorial was with aerobics, while Diane Kay determined that members express themselves through poetry at the start of each session. The judge had to take that one under advisement.

Nothing was spared as the grisly trial continued. Even Vanderbilt Hall was placed under the jury's scrutinizing eye as vamps Ute Lohrmann, Debbie Lerner and Katherine MacRae sang about the newly re-vamped "Harvard Dorm of Horrors."

Student dating was cross-examined when Matt Swiatek and Katherine MacRae sang the hot little number, "Med School Nights" to the tune of "Summer Nights": "Med school fun. There's really none/But oh those med school nights." And Linda Han and Kelli Bullard discovered one night while out on the town that, unfortunately, boys don't make passes at girls in medical school classes.

While the jury deliberated, the defendants and plaintiffs waited it out. It was universally known that the decision on this potentially precedent-setting case could go either way—the tension was high. Finally, the verdict was in: "There's no pathway like New Pathway/ Like no pathway I know/Everything about it is so breezy/Never have to study very hard/ Only have to worry 'bout my feelings/As I'm cheering my patients on." □

They've Met Their Match

"The number of students choosing internal medicine continues to rise," observed Curtis Prout '41, assistant dean and director of the HMS Internship Advisory Program. Though internal medicine had bottomed out two years ago, last year 39 students chose that specialty and this year 43 did, 9 of them in primary care.

Pediatrics (22, up from 14) and radiology (19 students) were also popular specialties. But only 12 students chose general surgery this year—an all-time low. Eighty-six HMS students are going to Harvard hospitals, and the next largest contingent (25) are California-bound. This year, 75 percent of students who entered the Match were accepted into one of their top three choices; 63 percent received their first choice.

Graduates and their intended specialties are:



ANAESTHESIA

Chen, Diane
Massachusetts General Hospital

Doering, Elana
University of Pennsylvania

Edmond, Byron
Brigham & Women's Hospital, MA

Mason, Yvonne
Presbyterian Hospital, NY

Morse, David
Brigham & Women's Hospital, MA

Wu, Benson
Massachusetts General Hospital

DERMATOLOGY

Canning, Susan
Faulkner Hospital, MA

Grichnik, James
Beth Israel Hospital, MA

Mirowski, Ginat
University of Massachusetts Hospital

Pion, Ira
Massachusetts General Hospital

EMERGENCY MEDICINE

Gonzalez, Rafael
Boston City Hospital, MA

Watson, Karol
UCLA Medical Center, CA

FAMILY PRACTICE

Anderson, Matthew
Montefiore Medical Center, NY

Potter, Michael
University of California/San Francisco

Woroncow, Halina
Mayo Graduate School of Medicine/
Rochester, NY

MEDICINE

Albert, Christine
Massachusetts General Hospital

Amsterdam, Peter
Brigham & Women's Hospital, MA

Bell, Douglas
Mt. Auburn Hospital, MA
(Preliminary Medicine)

Bunnell, Craig
Brigham & Women's Hospital, MA

Carter, Richard
Brigham & Women's Hospital, MA

Chen, Kathy
Brigham & Women's Hospital, MA

Cohen, Jonathan
Beth Israel Hospital, MA

Cranshaw, John
Cambridge Hospital, MA

Davis, Benjamin
Massachusetts General Hospital

Dion, Carol
University of Washington Affiliated, WA



Lebowitz, Howard
Brigham & Women's Hospital, MA

Leonard, Claudia
Beth Israel Hospital, MA

McGehee, Margo
Brigham & Women's Hospital, MA

Morgan, Jeffrey
Brigham & Women's Hospital, MA

Mortensen, Eric
Massachusetts General Hospital

Murray, Megan
Massachusetts General Hospital

Nastelin, Jennifer
University of Michigan Hospitals Ann Arbor

Powell, David
New York University Medical Center, NY

Pugh, Guy
Portsmouth Naval Hospital, VA

Stone, John
Johns Hopkins Hospital, MD

Sun, Susan
Stanford Affiliate Hospital, CA

Ting, Henry
Brigham & Women's Hospital, MA

Wilson, Byron
Stanford Affiliate Hospital, CA

Zwas, Donna
Presbyterian Hospital, NY

NEUROLOGY

Cudkowicz, Merit
Massachusetts General Hospital

Marshall, Frederick
Harvard/Longwood Area

Schwartzschild, Michael
Massachusetts General Hospital

Senkowski, Christopher
Mt. Sinai Hospital, NY

NEUROSURGERY

Barnett, Faith
Brigham & Women's Hospital, MA

Cohen, Douglas
Columbia University, NY

Freese, Andrew
University of Pennsylvania, PA

Mamelak, Adam
University of California/San Francisco

Sloan, Andrew
UCLA Medical Center, CA

Yu, John
Massachusetts General Hospital

OB/GYN

Learman, Lee
UCLA Medical Center, CA

OPHTHALMOLOGY

Choi, John
New England Deaconess Hospital, MA



Kinota, Stanislaus
University of Southern California/
Los Angeles

Lee, Yunhee
University of Southern California/
Los Angeles

Pierce, Eric
Massachusetts Eye & Ear Infirmary

ORTHOPEDICS

Gill, Thomas
House for Special Surgery, NY

Mintzer, Craig
Harvard Combined Orthopedic
Program, MA

Nash, John
University Southern California
Medical School



Pereles, Thomas
Hospital for Joint Disease, NY

Pierre-Jacques, Henri
St. Vincents Hospital, NY

Trauner, Kenneth
University of California/
Davis Medical Center

Worrell, Scott
Montefiore/Einstein-NY

OTOLARYNGOLOGY

Borud, Loren

UCLA Medical Center, CA

Clevens, Ross

Beth Israel Hospital, MA

Deschler, Daniel

University of California/San Francisco

Francis, Howard

Johns Hopkins Hospital, MD

Nissim, Kenneth

University of Pittsburgh, PA

Robb, Erica

University of Pennsylvania

PATHOLOGY

Hasserjian, Robert

Brigham & Women's Hospital, MA

Rubin, David

New England Deaconess Hospital, MA

Wolf, Nancy

Brigham & Women's Hospital, MA

PEDIATRICS

Barfield, Wanda

Walter Reed Army Medical Center,
Washington, D.C.

Barnes, Andria

Children's Hospital, MA

Davis, Carmon

Children's Hospital, MA

Epstein, Judith

Children's Hospital, PA

Evans, Helen

University of Alabama Hospital

Glaser, Nicole

Children's Hospital, MA

Hawkins, Douglas

University of Washington Affiliate

Kaplowitz, Lori

Children's Hospital, MA

Kohn, Melvin

Children's Hospital, MA

Kunz, Victoria

Children's Hospital, MA

Lara, Maria

Children's Hospital/Los Angeles

Lindsay-Barber, Mary

Children's Hospital, MA

Mao, Charlotte

Children's Hospital, MA

Need, Laura

Massachusetts General Hospital

Pelidis, Maria

Children's Hospital, PA

Rosenfeld, Anne

Children's Hospital, MA

Rothenberg, Mark

Children's Hospital, MA

Scheindlin, Benjamin

Children's Hospital, MA

Schulman, Erica

Massachusetts General Hospital

Sguigna, Carla

Children's Hospital, MA

Trevino, Anne

University of California/San Francisco

Wolfe, Joanne

Children's Hospital, MA



PRIMARY CARE

Avila, Diane

University of Hawaii Integrated Programs

Barrette, Ernie-Paul

Massachusetts General Hospital

Dewitt, Dawn

University of Washington Affiliate

Fischer, Gary

Massachusetts General Hospital

Koh, Theodore

Massachusetts General Hospital

Otero, Daisy

Bronx Municipal Hospital, NY

Pomerantz, Daniel

New York University Medical Center

Reynolds, Eileen

University of California/San Francisco

Sutton, Eliza

University of Washington Affiliate

PSYCHIATRY

Askins, Howard

UCLA Neuropsychiatric Institute

Becker, Anne

Massachusetts General Hospital

Bogenschutz, Michael

Cambridge Hospital, MA

Brenner, Adam

McLean Hospital, MA

Corcoran, Cheryl

Cambridge Hospital, MA

Faran, Michael

Tripler Army Medical Center, Hawaii

Hostetler, Anne

Yale-New Haven Hospital, CT

Lewin, Rebecca

University of Colorado School of Medicine/
Denver

Newman, Emily

Cambridge Hospital, MA

Richardson, Justin

McLean Hospital, MA

Rising, Catherine

McLean Hospital, MA

RADIOLOGY

Bennet, Genevieve

Massachusetts General Hospital

Bussey, Onie

Duke University Medical Center, NC

Chernoff, Daniel

Brigham & Women's Hospital, MA

Daniel, Bruce

University of Michigan Hospitals/Ann Arbor

Frost, Elisabeth

Beth Israel Hospital, MA

Gudas, Thomas

Brigham & Women's Hospital, MA

Knutzen, Anders

Mayo Graduate School of Medicine/
Rochester, MN

Lee, Kathleen

Brigham & Women's Hospital, MA

Lee, Robin

University of California/San Francisco

Lewin, John

University of Colorado School of Medicine/
Denver, CO

Lin, Eva

University of California/San Francisco

Mack, Julie

Baylor University Medical Center, TX

Noronha, Michael

UCLA Medical Center, CA

Ott, Ingrid

The New York Hospital, NY

Pangie-Schwartz, Caroline

Lahey Clinic Medical Center, MA

Pechet, Tiron

Lahey Clinic Medical Center, MA

Rastegar, Joan

New England Deaconess Hospital, MA

Schwartz, Rebecca

New England Medical Center, MA

Smith, Darrell

Brigham & Women's Hospital, MA

Staub, Ariane

Brigham & Women's Hospital, MA

Taratuta, Elena

New York University Medical Center, NY

SURGERY

Allan, James

Massachusetts General Hospital

Arellano, Ronald
University of California San Diego
Medical Center

Cervantes, William
Harbor-UCLA Medical Center

Chen, Catherine
New England Deaconess Hospital, MA

Felsen, Ruth
Massachusetts General Hospital

Forbess, Joseph
Duke University Medical Center, NC

Frazier, Daved
New England Deaconess Hospital, MA

Hirmand, Haideh
New York Hospital, NY

Lee, Robin
University California San Francisco

Moore, Milan
Walter Reed Army Medical Center,
Washington, D.C.

Moulton, Michael
Barnes Hospital, MO

Phillips, Preston
Yale-New Haven Hospital, CT

Ruth, Robert
University of Massachusetts Coordinated
Programs, MA

Senkowski, Christopher
Mt. Sinai Hospital, NY

Zaragoza, Bernard
New York Medical College-Valhalla, NY

TRANSITIONAL

Toy, BeauJames
CMHC/St. Joseph's Mercy, MI

UROLOGY

Duel, Barry
Brigham & Women's Hospital, MA □

celebration, it will hold a ceremony, marking both the reopening of Vanderbilt and the association's own role in the hall's history.

Federman believes that present-day alumni are just as apt to respond to his request for "centi-Vanderbilts" as alumni were quick to respond to the "student housing crisis" that motivated the Alumni Association to take action in the 1920s.

William K. Stone, dean for resource development, shares Federman's optimism. The Office for Resource Development is currently seeking one alumnus or alumna to establish a \$1 million Vanderbilt Challenge grant. The grant would take effect if alumni contributions to Vanderbilt total a minimum of \$2 million from July 1, 1990 to the completion of the campaign on December 31, 1991.

Federman and Stone agree that alumni have plenty of incentive to become "centi-Vanderbilts." For example, every graduate who pledges at least \$10,000 will become a Vanderbilt Hall Associate. A plaque at the entrance of Vanderbilt will acknowledge the generosity of each donor.

Every alumnus or alumna who pledges a minimum of \$20,000 will have the opportunity to name any one of the 324 residential rooms in Vanderbilt. Since the interior layout of the hall has

CAMPAIGN REPORT

The Vanderbilt Challenge

Dan Federman has a plan for Vanderbilt Hall. The plan, says the dean for medical education, is "to find one 'centi-Vanderbilt,' then another, and hundreds more" willing to contribute toward the renovation of the student dormitory, which reopens on schedule this fall 15 months after a complete overhaul of its interior commenced.

Although he hasn't given up looking, Federman admits that the chance of finding another benefactor like Harold S. Vanderbilt—someone willing and able to fund the entire cost of renovation—is remote.

But he does believe that many HMS alumni, if asked, would agree to become "centi-Vanderbilts"—willing to make a smaller, but as important pledge toward Vanderbilt Hall. Federman is asking each alumnus or alumna who can do so to consider pledging \$10,000 over a five-year period. The dean has never lacked optimism, but he thinks this hope is well founded.

First, he points to the support alumni have shown for the Vanderbilt project

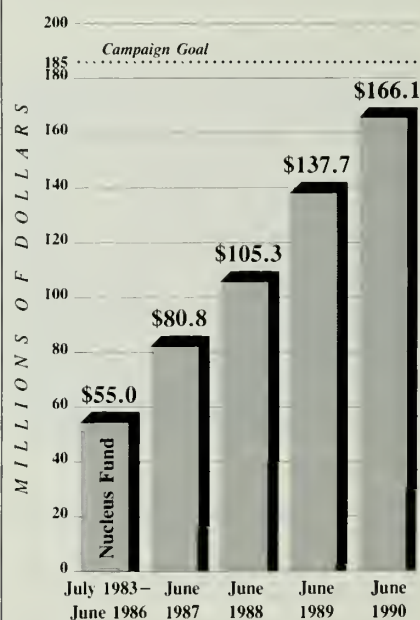
during the current Campaign for the Third Century of Harvard Medicine. Since the start of the campaign in the fall of 1986, alumni have contributed nearly \$1 million toward Vanderbilt's renovation.

He recalls the inspiring words of one alumnus, a campaign volunteer in Atlanta, who said that "every HMS graduate who has practiced medicine over the past 25 years should have at least \$10,000 in his hip pocket to give back to the school as acknowledgement of what HMS has done for our careers."

Federman also emphasizes the tradition of alumni involvement in the history of Vanderbilt Hall. As big a role as Mr. Vanderbilt played in funding it, the drive to raise money for a student dormitory was totally an alumni effort. In fact, the fund drive, which commenced in the fall of 1923 and was completed in only two short years, was the first project of the Harvard Medical School Alumni Association.

The Alumni Association coincidentally marks its 100th anniversary this fall. As part of a year-long centennial

Campaign for the Third Century of Harvard Medicine



The Campaign reached \$166.1 million in gifts and commitments as of June 30, 1990. The Campaign goal is \$185 million.

gone mostly unchanged, alumni may be able to name the room they called home.

As Loren MacKinney '45, who has pledged to name his old room, said, "Having your name on a Harvard building for a mere \$20,000 is a bargain beyond belief!"

Other naming opportunities associated with Vanderbilt Hall include the two music rooms, each for \$20,000; the meeting room in the Deanery for \$25,000; the computer room for \$25,000; the six squash courts, each

for \$30,000; the basketball court for \$50,000; the common room in the Deanery for \$100,000; the courtyard and tennis court for \$300,000; and the new athletic center for \$500,000.

The alumnus or alumna who provides the \$1 million for the Vanderbilt Challenge will have the opportunity to have the West Wing of Vanderbilt named in his or her honor.

Perry J. Culver '41 has donated \$50,000 to name the student lounge on the first floor of Vanderbilt in his honor. □

BOOK MARKS

Compelling Reading

THE BOY WHO COULDN'T STOP WASHING by Judith Rapoport, E.P. Dutton, 1989.

by Thomas Spencer

Two out of every 100 people now have, or will have, obsessions or compulsions that significantly interfere with their normal lives, cause distress, or occupy a great deal of their time. This is one of several startling findings about obsessive-compulsive disorder contained in Judith Rapoport's highly readable book, *The Boy Who Couldn't Stop Washing*.

Why didn't we in psychiatry know this before? Because many sufferers did not know their affliction had a label, or that others had it. They didn't know that OCD could be "treated," i.e., that it was a medical illness. Furthermore, we doctors couldn't see it; either because we didn't ask patients about the symptoms, or because we thought the symptoms to be an integral part of personality, acquired by repetitive interactions at a critical period of early childhood.

Obsessive-compulsive disorder is strictly defined in DSM-III-R. It has similarities with, but is in no way equivalent to, an obsessive or a compulsive personality. The diagnosis of obsessive-compulsive disorder requires either true obsessions or compulsions. DSM-III-R defines obsessions as "recurrent and persistent ideas, thoughts, impulses, or images that are experienced, at least

initially, as intrusive and senseless, e.g., a parent's having repeated impulses to kill a loved child, a religious person's having recurrent blasphemous thoughts." DSM-III-R defines compulsions as "repetitive, purposeful, and intentional behaviors that are performed in response to an obsession, or according to certain rules or in a stereotyped fashion."

In a book intended primarily for a lay audience, Rapoport '59, chief of the child psychiatry branch of the National Institute of Mental Health, addresses the disorder by using patients' descriptions and her own general musings. Rapoport quotes Konrad Lorenz, who labels himself and other ethologists as "starkers at animals," and describes her own attempts at understanding OCD similarly.

We are all blinded by our own prejudices, and in Rapoport's case, the prejudice was a classic early training in psychiatry. The Freudian explanation for obsessions and compulsions is a "strictness" of parenting during the second year of life around issues of control and toilet training. In his work with patients, Freud was "experience near," that is, he was able to discuss patients' fear in their own language. This had been the approach to treatment of OCD until the advent of behavioral therapy and, more recently, psychopharmacology.

As the Freudian-trained Rapoport's career advanced, she treated many

severely disturbed OCD patients and found classic psychoanalysis to be of limited value—as either an explanation or a treatment. Eventually, dramatic medication treatments became available that could rapidly normalize some of these patients. This experience, as well as other scientific discoveries, led to what Rapoport terms a biology of "free will and the uncertainty of knowing." In other words, free will seems absent in patients who are compelled to repeat meaningless rituals, and the "doubting" of reality seems to underlie these patients' absurd obsessions and checking behaviors.

For those less familiar with the disease, the descriptions and life stories will be the most compelling. Patients, such as Zach, describe the intricacies of their sufferings and symptoms in their own language: "I am now nine years old. When I was six years old, I started picking up things with my elbows because I thought I would get my hands dirty if I picked things up with my hands. By the time I was seven I was washing my hands 35 times a day. I had to do it. They felt dirty. I imagined that God picked me because He gave me some gifts so He had to give me some problems."

Zach's father, Sam, describes his own hidden, severe OCD. Sam was a successful businessman who handled multi-million-dollar transactions even as he constantly battled his obsessions. His wife knew something was wrong with Sam but saw only controlled rage, secretiveness and peculiar behavior. She demanded that he see a psychiatrist, who gave his illness a name.

Zach responded to medication and not only has fewer rituals now, but is less depressed and more social. Sam took longer to respond, and did so only partially, but he and his wife have "much greater strength because of their understanding of the disease."

Rapoport reports that some patients feel that the disease comes from outside themselves, but that it doesn't help to simply confirm for them that no harm will come from their thoughts. OCD involves excessive or unreasonable behaviors (washing, checking, straightening) and thoughts (I must have killed someone). Patients feel that if the action or thought is not performed urgently then something very bad will occur. They tend to gradually accrue specific systems of cause and effect, sin and punishment that Dante would surely have placed in the inner circle of hell.

Rapoport quotes Von Economo on the "subjectivization" of impulses, and gives the example that a seizure will

feel like a muscle twitching, whereas a motor tic may feel like "I have got to move my hand that way." With OCD it is a mental tic: I have to check, I must wash. Here, behavioral therapy is a useful adjunct to medication. In therapy, people learn to battle their own "wish" to ritualize. In forcing themselves to forgo the ritualistic defenses, patients paradoxically lower their expectations of certain calamity.

Laura describes her severe OCD, which she had kept secret for 15 years. She sought treatment at the insistence of her husband because her OCD interfered with their relationship, specifically their sex life. Laura spent much of her day secretly checking, counting and washing. She also hoarded small scraps of paper.

At age seven, Laura had begun washing her hands obsessively. Soon she had the compulsion to fill in the spaces in letters such as o, p or a. Next came the necessity of counting to 50 between reading and writing each word.

"I had this idea," Laura tells Rapoport, "that this was a way for the Martians to make contact with Earth. It made me feel important and it was almost worth it some days. Because then there was a reason for it all, and then I was sort of chosen to be special . . . I didn't want anyone to think I was crazy."

At age eight, Laura was placed in a school for the mentally handicapped. She hid her problems from family and school, and spoke and worked with excruciating slowness during the day. At night, after finishing her rituals, she was finally able to read.

The compulsions died down by high school. "I was so used to counting, I almost didn't know what to do without it. I was even sort of sad for a while that the Martians didn't need me anymore. But by then, I really knew that it wasn't Martians."

Laura went to a regular high school and even attended community college, but she continued to feel isolated by residual disease. When she sought treatment at age 22, the drug clomipramine was used, which helped with the compulsions but not her sex life. Behavior therapy is working, slowly, with some benefit for her sexually and for her compulsions.

Depression is a much more familiar human disease than OCD. Although OCD actually parallels depression in some regards, OCD is a much less intuitively psychological dilemma. Paradoxically, we have been much slower in recognizing OCD's biological nature.

Rapoport describes the scientific

evidence that shows that the part of the brain known as the basal ganglia is involved in OCD, (as well as in the related conditions of Tourette's syndrome and some forms of Parkinson's disease). She describes a fascinating parallel to "hard wired" animal behaviors, and she is struck by seeing a "complex behavior pattern develop in an identical fashion among many unrelated people. I find a model, a beginning for understanding the fixed patterns I see in our washers (read groomers), ritualizers (read ritual displays), and collectors (read as nesters and hoarders). Cleaning, avoiding, checking and repeating relate to the most basic pre-occupations of cleanliness, safety, aggression and sex."

*By the time I was seven, I
was washing my hands 35
times a day. I had to do it.*

Dr. S., a psychologist with OCD, describes an obsessive attack he had while driving to take a final exam: "I'm intruded with the heinous thought that I might have hit someone . . . a human being! 'Come on,' I think to myself, 'this is really insane!' But the awful feeling persists. I start ruminating, 'Maybe I did hit someone and didn't realize it. Oh, my God! I might have killed somebody! I have to go back and check.' My fantasies run wild. I desperately hope the jury will be merciful. I'm particularly concerned about whether my parents will be understanding. After all, I'm now a criminal."

He goes on to describe his frantic search for evidence on the road. He is initially relieved and drives on, but then has the alarming thought, "Maybe I should have pulled off the road and checked the side brush where the injured body was thrown and now lies." He is compelled to turn around and search a second time for the "corpse." After driving by quickly, he proceeds to the exam.

But, his attack "relentlessly continues. 'I didn't get out of the car to actually look on the side of the road!'" He returns to the site of the feared event and begins "rummaging around in the brush." A policeman happens by to whom he offers a banal excuse for his behavior. He thinks, "God, maybe I really did hit someone. Why else would a police car be in the area? I want to go

back and check more but I can't. You see, the police car is tailing me on the highway. I'm now close to hysteria because I honestly believe someone is lying in the brush bleeding to death."

He reluctantly goes on and takes the exam while obsessing. Afterwards, he furtively checks the area on the road again and returns home. He continues to have attacks of doubts about what really happened and has to check his car for dents over and over.

Dr. S. has had attacks of this type virtually every day for 11 years. Five relatives have the disease but never talked about it, even to each other, until he "broke the silence."

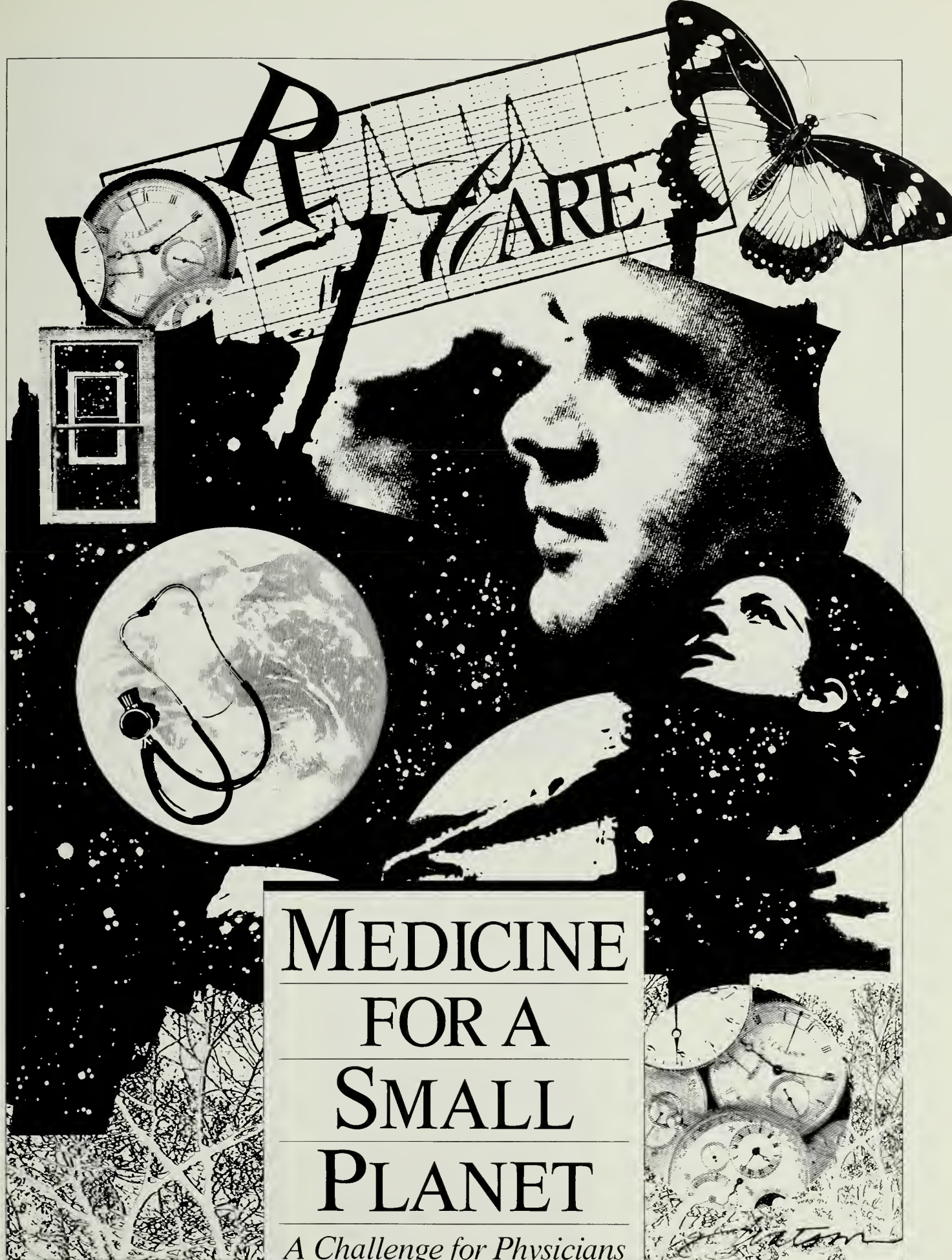
"Many of the obsessions and compulsions were based on an extraordinary fear that my aggressive impulses, my anger, would, without me knowing it, leak out. I always thought I would start a fire by being negligent with cigarettes or kill someone by being a reckless driver. My vigilance was ongoing . . . and exhausting.

"Each obsessive incident was accompanied by the fantasy that if I didn't act on it, something terrible would happen to me or someone else. Losing my job, being sent to prison, or hurting someone else were average catastrophic fantasies. My wife couldn't stand my illness. I hid much of it from my wife so as not to embarrass myself and upset her. I learned to be a great actor."

On medication, the thoughts would occur but stop almost immediately. Unfortunately, as Dr. S. began to improve, his four-year-old son, Jeffrey, developed his own obsessive-compulsive disorder. Jeffrey had stereotypic behaviors: he would flap his arms excitedly and his entire body would contract, he would wiggle his fingers above his eye level and dangle strings in front of his eyes, often for four hours a day. Dr. S. describes the agony of self-blame as a parent, and the devastating effect of this severe illness on normal family life.

The actual detailed descriptions by patients of their washing, checking and ruminative rituals are rich and lively. Rapoport gives us exhaustive accounts of different kinds of suffering—from a hair-pulling compulsion to an obsession with the notion of having murdered someone, to the mental gymnastics of avoiding contamination—so that the extraordinary variety of this disorder is fully appreciated. These descriptions will remain classic even as our scientific knowledge advances. □

Thomas Spencer, MD is a clinical fellow in child psychiatry at Massachusetts General Hospital.



MEDICINE FOR A SMALL PLANET

A Challenge for Physicians

Watching the horizon for signs of the next century, we know already that the problem of regional and global environmental change will continue to loom large. The question of what lies ahead for the environment poses a particular set of challenges for physicians, who are bound by a professional commitment to care for the health of human beings.

Some of these challenges resemble those posed by other social and scientific problems and require actions that are familiar to us. Other challenges may require a fundamental realignment of our world view.

Whoever wishes to investigate medicine properly should proceed thus: in the first place to consider the seasons of the year, and what effects each of them produces. . . . Then the winds, the hot and the cold, especially such as are common to all countries, and then such as are popular to each locality.

—HIPPOCRATES

The first challenge arises with regard to environmental changes that have been definitively shown to affect human health. Insofar as these changes have or soon will have a negative impact, it is the physician's task to understand them. To the extent that these environmental changes can be reversed or prevented, it is also the physician's task, often acting in concert with others, to engage in public action to that end. This professional responsibility is based on the public health model of medicine, which has developed robustly since the mid-19th century, and has helped secure many of the major advances in the health status of populations in the industrialized world.

The more uncertain prospect of great environmental change with more speculative consequences for human beings creates a second kind of challenge for physicians. Scientists are not yet sure about the scope of what is being termed "global climate change"

and physicians thus lack certainty about the health effects of many of the possible scenarios under discussion.

What do physicians do in other settings where certainty is not attainable? We stay open to the evidence, participate in further research where appropriate, and act on the side of caution, (which means acting to protect the health of individuals and society). Such a stance characterizes, for example, the current medical approach to the question of cholesterol, a subject about which there is also much interest and much uncertainty.

Both of these challenges created by current or anticipated environmental change can be faced by physicians and dealt with in ways similar to those invoked in other contexts. We do not require significant new theories. Strategies of response resemble those employed in the past, and analytic methods currently in use will continue to be appropriate.

The third challenge the environment now confronts us with requires physicians to entertain a new paradigm of thought. We know that many species are vulnerable to changes in their ecosystem, and we have studied them in relationship to the environmental niches they occupy. Yet we have not had to develop—let alone incorporate into the medical and scientific approach to human health and disease—such an understanding of human beings. As the most adaptable among the world's creatures, we have studied ourselves in isolation from other life forms.

Only now, as we start to apprehend the news of potentially sweeping environmental changes, are we also beginning to realize that in this one essential respect we know much less about ourselves than we know about sea turtles, mountain lions, beavers or ocean plankton.

Human beings, traditionally studied as individuals or in relation to other human beings, must now be understood as subject to a multiplicity of biological interactions, far more permeable to, and influenced by the world in which we live, than we have ever previously realized. This realization carries new and potentially profound implications for physicians.

We are now living with some of the less desirable fruits of the industrial revolution. Developed societies increasingly face toxic contaminants in our soil and pollution of our air, rivers, streams and oceans. The growing disparities between the economies of the

northern and southern hemispheres cause or contribute to spreading environmental degradation throughout the world: tropical deforestation, soil erosion, desertification and pockets of intense industrial pollution.

Throughout the world, the movement of populations from rural to urban areas exposes an increasing number of people to ever more toxic environments. The problems of air and water pollution are intensified by severe overcrowding, poor sanitation and inadequate shelter. Throughout much of the 17th and 18th centuries, residents of the city of London had a higher death rate than any other locale in England. This same pattern of accelerated urban death rates, at least for particular diseases, can be found in many countries today.

In Mexico City air quality is so poor that in recent years, schools have been closed for a month at a time, and birds can be seen falling dead from the sky. In certain cities in Eastern Europe, where uncontrolled smokestack emissions blacken the air and the buildings, the death rate from cancer and respiratory disease far exceeds the national average. In the United States an increasing number of studies are documenting associations between ambient levels of ozone or particulate pollution and hospital admissions of children and/or adults for asthma, bronchitis or other forms of respiratory distress.

For physicians trained to take care of one person at a time, these widespread assaults on human health might seem outside our capacity to combat, were it not for the public health tradition with which we are all familiar. In 1854, in the midst of a cholera epidemic in London, John Snow tracked the deaths and found that they fit what we now call a point source distribution: the deaths all occurred within the geographic boundaries of the Golden Square area, which exactly overlapped with the water catchment controlled by the public water pump on Broad Street.

With some difficulty, Snow persuaded the London Board of Health to consider a possible relationship between deaths from cholera and drinking the water in this area. The epidemic abated after he received permission to have the handle removed from the Broad Street pump.

Milestones in public health stud our history since then. The pattern is clear: identify a problem, work to understand its etiology, and then take whatever civic, population-based action is appropriate. This model strongly influences physicians who seek to prevent nuclear war, and has been adopted by the World

Health Organization as the only effective response to the overwhelming magnitude of this potential public health crisis.

Treating one case after another of pollution-induced respiratory illness, managing children irrevocably damaged by lead poisoning, or palliating the symptoms of workers dying from environmentally induced pulmonary and liver diseases are all necessary and significant tasks for physicians. Yet as we understand the etiologies of these illnesses, it is also incumbent upon us to participate in the public policy debates that will change the ways in which we produce goods and services, and manage our personal and industrial wastes.



The current metaphor for drastic environmental change is global warming, which holds in one concept the synergistic consequences of several possible trends: stratospheric ozone depletion caused by chlorofluorocarbons and nitrogen oxide; atmospheric warming caused by heat trapping of accumulated nitrogen oxide, methane and carbon dioxide (industrial emissions called the "greenhouse gases"); and the effects of other industrial emissions such as sulfur dioxide, which contributes to acid rain.

These trends, described in varying tones of certainty by a range of atmospheric and biological scientists, portend the following scenario: a progressive warming of the global climate—from 1.5 to 5 degrees centigrade over the next century; increasing exposure to dangerous ultraviolet radiation; and accelerating destruction of forest cover. These trends sum to a world less green and diverse than the one we recognize, a world in which all living creatures

*Physicians need to pay
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In the midst of scientific
uncertainty our role
is clear.*

will be exposed to more intense heat and more deadly sunlight, and where many populations of plants, animals and humans will face death or forced migration out of regions suddenly rendered hostile by relatively rapid coastal flooding, or alteration in baseline climatic temperature.

This scenario darkens or lightens depending upon the computer simulations employed. At least 14 different groups around the United States are engaged in climate modelling, and the outcomes vary depending upon the inputs and the models used. Newspapers, scientific journals and congressional records detail the range of disagreement among experts, and the consequent range of policies proposed. The dimensions of the actual, scientific controversy may well turn out to be overshadowed by the scale of international cooperation and coordination that would be required to institute effective remedial public action.

Physicians need to pay attention to this debate. In the midst of scientific uncertainty our role is clear. We must stay abreast of the argument and evaluate the evidence as it becomes available. In this regard, the evidence we are trained to evaluate, whether relevant to individual health or the population effects of disaster, is in fact already amassing. For example, much is known about the effects of hyperthermia on human populations, and about temperature extremes, which first affect mortality among the aged and very young.

Indications that light-skinned human populations throughout the world are facing a mounting epidemic of skin cancer is another example. Studies linking immunologic deficits to increased exposure to ultraviolet radiation can be seen to apply as well in the context of ozone depletion caused by chlorofluorocarbons. Famine is afflicting the populations of Sahel, an area rapidly turning into desert as the encroaching borders of the Sahara move south at the rate of 300 yards to one mile per year.

Extremes of weather, predicted to occur more frequently in the global warming scenario, are now exacting an ever-increasing toll on populations clustered in progressively greater densities. Death and dislocation attend heat waves in Athens and Boston, coastal floods in Bangladesh, and torrential rains and mudslides in the barrios of Rio de Janeiro.

In this whirl of information from diverse sources we can discern the outline, if not the small features, of future perturbations.

There is also an internal consistency,

a logic in this mix of information, that is most understandable to physicians, who are accustomed to thinking in terms of biological processes. Central to the concerns of the climate scientists are the timing and magnitude of threshold effects and their interactions. Physicians deal with similar issues in assessing the course of health and illness in human beings.

We are familiar with the observation, reinforced through repeated experience, that after a certain point in the evolution of natural or disease processes (pregnancy, aging, malignancy, sepsis, coronary artery disease, hemorrhage), new dynamics intervene and old interventions become useless or harmful. The metaphor of global warming, therefore, should ring bells of recognition: the observed pace of changing events and the relationships between them can be expected to occur at accelerating, and possibly progressively disjunctive, rates in the future.

Understanding these issues and staying on top of the scientific debate, however, is not sufficient to acquit physicians of responsibility. The factors identified in the models of global warming pose immense potential harm to human beings. Action to forestall the darker scenarios have been amply articulated: reduce reliance on fossil fuels, conserve all forms of energy use, explore alternate and renewable sources of energy, eliminate production and use of some unequivocally toxic chemicals, limit human population growth, and protect tropical forests and remaining regions of fertile land. Furthermore, independent of the impact of global warming, human society must introduce strategies now and into the next century to adjust to inevitable shortfalls in fossil fuels in less developed countries, accumulated toxins in industrial nations, and population pressure on arable land worldwide.

For physicians—required to act on behalf of our patients—the guideline for such actions in the setting of uncertainty has been transmitted through an historical series of ethical codes, encapsulated in the adage we learned early in medical school: *primum, non nocere*. When faced with a hazard of uncertain effect and magnitude, we warn our patients to avoid it, to take action to minimize it, and we participate in further study of the problem.

In proposing such modification in patient behavior, we must take into account its costs, since every action has intended and unintended consequences. It is not wise to advocate on the basis of little evidence a major shift

in lifestyle. In any context, however, it is prudent to recommend that individuals and groups take steps whose benefits can be seen to far outweigh the costs—measured in both the short- and long-term.

Physicians are not the experts on what is known regarding issues of environmental change. Nor are we trained to take the lead in designing the research studies to sort out the large and fine details in the future-based scenarios. Our patients, however, are directly and variously affected by these changes, and we have substantial influence on how people interpret and react to scientific evidence gathered by others.

In recognition of the appropriate role that physicians can play in the ongoing discussion of major environmental change, several organizations of physicians in this country and around the world have expanded their agendas to include environmental concerns. A number of conferences in the last year have brought physicians together with environmental scientists and policy makers in efforts to outline possible areas of collaborative work and cooperation. The message we hear repeatedly from these scientists and policy experts is that physicians are needed to help design studies that will best elicit whatever human-environment interactions may be occurring, to help translate technical findings to law makers and the lay public, and to add our voices to the call for concerned civic action when it is scientifically indicated.

Physicians, like all others reared in the Western traditions of science and religion, think of *Homo sapiens* as the dominant species on earth and the biosphere as subject to our needs. This perspective permeates and determines many aspects of our lives and thought. Expressed in the extreme, we can see its limitations.

Author Ayn Rand provides us with a severe statement of this point of view: "Man's unique reward, however, is that while animals survive by adjusting themselves to their background, man survives by adjusting his background to himself," (*For the New Intellectual*, 1961).

A more recent, politicized and beleaguered statement of this perspective, uttered against a backdrop of environmental activism, was delivered by Richard Darmon, the current director of the U.S. Office of Management and Budget: "Americans did not fight and win the wars of the 20th century to make the world safe for green vegetables," (*Washington Post*, May 2, 1990).

In medicine, built on the notion of

human dominance and primacy, a preoccupation with disease introduces an additional view of human beings. Although the species may be dominant, the individual is perceived as vulnerable. The body is encased in skin and invested with mucus membranes to protect internal structures and processes from invasions of the outside world. We are taught to think of the human body as an embattled being surrounded by hostile forces, defending itself against disease and external stressors. A distinct separation of the human organism from all other organisms, through surfaces rendered as impermeable or as resistant as possible, marks the physician's view of human health.



Neither of these two perspectives on human beings accounts for a range of biological realities and psychological or physical phenomena, variously described and variously interpreted, which point towards a very different concept of human beings and human health. In this concept, humans are seen in relationship to the biological world. The ways in which humans grow, respond and act are interpreted in the context of the environmental niche they occupy. As there are notions of human health and disease, there are also closely related notions of what constitutes appropriate human habitats.

In nascent form, this ecological conception of human beings lives within the fields of public health, particularly demography, epidemiology and occupational medicine. It would be stretching things, however, to say that the study of human ecology has achieved the status of a scientific or medical discipline. Despite the fact that intensifying environmental concern in all quarters

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are human.*

has fueled a renewed interest in the general subject of ecology, the NIH, for instance, does not fund research in human ecology, considering the subject unrelated to human health. It is also not helpful to the future of this field within medicine that a distinctly non-mainstream current in popular medicine, attending to questions of food allergies and illnesses induced by multiple chemical sensitivities, has been given the name "clinical ecology."

Among the biological realities that support the quest for human ecology are some that are so well documented and explained that they have become established tenets of scientific understanding—although not to the extent that they have altered the prevailing scientific and medical view of dominant human beings inhabiting a hostile and alien world. In this category one can include the recognition that organisms that breathe oxygen and expire carbon dioxide, including human beings, are fundamentally dependent upon organisms whose metabolic systems take up carbon dioxide and expire oxygen. At a most simple yet vast scale of the earth's life cycle, humans are just one of many participants in the interactive metabolisms of carbon, oxygen and hydrogen.

The relationship between light-dark alterations and observed circadian rhythms in human physiology and psychology constitute another accepted biological reality. Mental acuity, manual dexterity, energy levels and emotional well-being are all subject to variations in ambient levels and cycles of light. Human processes, as well as those of plants and animals, are more susceptible than we once thought to dictates of biological clocks.

Other observations and anecdotes that could be interpreted as further evidence of the interdependence of human beings and our world now exist simply as phenomena without explanatory homes. A few studies of patients in hospitals and children in playgrounds suggest that there is something healing or stabilizing in placing human beings close to trees. The presence of pets in households or nursing homes improves some indices of health, and perhaps promotes longevity in elderly people. Patients on hospital wards, removed from the usual environmental stimuli, are prone to develop what is termed ICU psychosis. A central element in many torture techniques is deprivation of environmental cues.

There is also the suggestion that living in a ravaged environment is contributing to an increase of psychiatric

distress among some residents of Prince William Sound. A disparate group of people in Japan are beginning to protest the pace of golf course construction, which is encroaching on the marginal remains of rural countryside. Their argument rests on two points: the chemicals used on golf courses contribute to unacceptable levels of toxic pollution, and the destruction of the traditional Japanese landscape will undermine the cultural structures of the society.

The naturalist tradition in Western science has contributed greatly to the study of ecology in general, but offers little to help us define the interrelationships between humans and their environment. Instead, in the writings of Loren Eiseley, Aldo Leopold, Peter Matthiessen and John Muir one finds rich and evocative affirmation of the value of these interrelationships, and personal testimony from these naturalists about the wonder and beauty of the natural world. Such work, however, is insufficient to advance our empirical or theoretical understanding of what it is in some human beings that hungers for natural surroundings, and what might be the human consequences of depriving access or destroying the source.

In Western literature, for example, the facets and forces of the environment can often be seen as centrally important to human life. A sense of place—in conferring what it is to be human, in determining and validating our needs for reference, identity and meaning—inspires such major writers as Willa Cather, Isak Dinesen, William Faulkner and E.M. Forster. Yet we have no way to describe, track or monitor the ways in which the presence or absence of a sense of place might be mediated in the human physiological and psychological systems as they are now understood. We lack the hypotheses, the experimental design and the tools to assess.

From a number of perspectives it might be argued that it is not necessary or proper for medicine and science to search for evidence of the connection between humans and the environment. One point of view held by many ecologists is that this connection lies as much in the realm of aesthetics and moral education as it does in biology. As the Humane Society says, "To teach a child not to step on a butterfly does as much for the child as it does for the butterfly."

Another, related argument is that there exists immense value in the natural world entirely apart from its effects or interactions with human life—a value based on a mix of biological reverence and aesthetic appreciation for diversity,

symmetry, balance, complexity, completeness and separateness. The ethic that flows from this value is expressed by Aldo Leopold in *The Sand County Almanac*:

"Examine each question in terms of what is ethically and esthetically right, as well as what is economically expedient. A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."

This argument has the same structure as the defense of human value based on natural law. The circularity in this logical structure has not been challenged insofar as it relates to human beings. Over the centuries it has proved convenient for us to assert that we are valuable because we are human. But simply to assert the in-itself value of the natural world may not prove sufficient to withstand the press of technology, population pressure, economic expansion and sheer human bloody-mindedness.

Furthermore, as McKibbin has pointed out, there are very few places left on earth where human settlement has not introduced permanent alterations in natural ecosystems. In fact, so much has changed so rapidly that in many areas of the world, humans and nature are being asked to make new accommodations based on new understandings and relationships: the people of Rwanda and the mountain gorilla must learn to prosper side by side; the raccoon, opossum, Canada goose, and coyote must continue to share acreage with suburbanites in the U.S. Northeast.

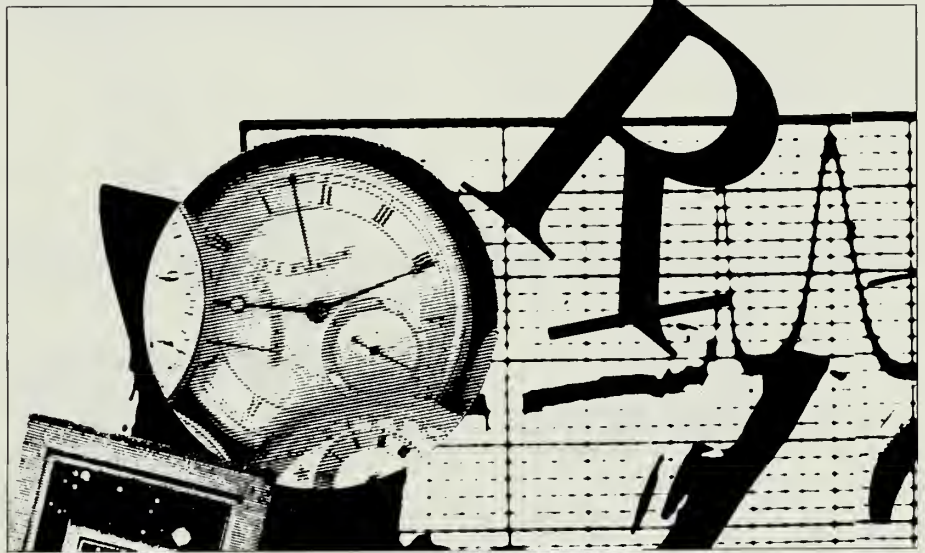
And to think of the issue as encompassed in the realm of aesthetics and moral education should not place it off-limits to scientific inquiry. It is in part because we have no scientific basis for understanding any of these very important elements in our lives that many leaders in the field of artificial intelligence—the high priests of modern technology—have managed to enlist entire research communities in the pursuit of an immortal machine, a computer that will in their view consign human beings, with bodies, emotions and sensibilities, to the ashbins of history.

We have not developed a science of human ecology, let alone a body of medicine particular to this topic, because we have not yet been forced to do so. Returning to the element of trenchant truth in the statement of Ayn Rand, a distinguishing characteristic of human beings has been our amazing capacity to adapt to social and environmental change. We have accom-

plished this adaptive capacity largely through the exercise of our intelligence, aimed at solving problems and creating supportive technologies.

We have repeatedly shown ourselves to be free, or at least apparently free, of the constraints and limitations that define patterns of life for the rest of the animal kingdom. To complete one reproductive cycle, the Gulf sea turtle must return to her birthplace in order to lay eggs. Not to permit the sea turtle to go home again consigns the species to extinction. The mobility of modern human beings is legendary and has not appreciably affected reproductive capacity.

Only in the 20th century, and primarily since the invention of the atomic



bomb, have many sound secular minds turned to the question of human annihilation brought about by our own profligacy, indifference and arrogance. Yet, as environmentalists, population experts and climate scientists are beginning to tell us, it is not just the atom bomb that is ticking. Eventually, and better sooner than later, we must learn how to discern the contours of our own nest, and in cleaning it up, save the nests of all other species as well as our own. □

Jennifer Leaning, SMH, MD, is director of the medical program evaluation and chief of emergency services at Harvard Community Health Plan. She is on the board of directors of Physicians for Social Responsibility and of Physicians for Human Rights, and on the advisory board of International Physicians for the Prevention of Nuclear War.



Edgar
Wayburn: From
California
to the
Redwood
Forest

by Sarah Jane Nelson

At the age of 83, Edgar Wayburn '30 doesn't give up easily. He has lead successful fights over the past 40 years to save millions of acres of land for conservation. These victories reach from the Golden Gate National Recreation Area and the Redwood National Park in California, to the remote rivers and mountains of Alaska. Since his retirement from medical practice in 1985, Wayburn has devoted himself full time to this work.

The conservationist in Wayburn first became active when he returned to San Francisco after World War II and found his beloved landscape altered. It was the spark that transformed him: "I perceived a marked difference. Before the war, areas such as the Sierra Nevadas had not been too heavily used by humans. The San Francisco Bay area—what I call the Hills of Home—was discovered by the U.S. military during World War II and by 1946, people were rapidly moving in. The population of the Bay Area was spreading, and wild places were being replaced by subdivisions. I came to the realization that I personally had to do something."

Wayburn didn't know when he graduated from HMS in 1930 that he would become a conservationist: "But, it was perhaps in the cards. I had always had a feeling for places of beauty." When he was in college, he just missed getting a Rhodes Scholarship. "If I had, perhaps I would have been a poet." Inspired in part by Sinclair Lewis's *Arrowsmith*, he then decided on medical research.

Wayburn was a younger-than-average college student—he entered the University of Georgia at the age of 15 and graduated at 19. He went into his senior year with no science except physics and psychology, and had to scramble to get enough credits for medical school. After some years of doing part-time medical research, his priorities shifted once more: "After World War II I began to realize that taking care of individual patients wasn't enough," recalls Wayburn.

Starting in the 1950s Wayburn made special efforts to heighten physician awareness of the broader aspects of environmental health. He helped spearhead the anti-smoking campaigns of both the San Francisco Medical Society (for which he has served alternately as director, president and editor), and the California Medical Association. Even among fellow physicians it took many years for his message to take

hold: "What I found out is that one must be persistent, particularly with issues pertaining to the environment." It is only an individual's tenacity that protects him or her from cynicism and despair, he says.

"When I first felt 'the call' to do something about the environment, there was no obvious connection between medicine, public health and environmental health." And the politics of medicine taught him another lesson that would later carry over into his conservation work: "You couldn't just oppose, you had to propose."

The power of his positive thinking knew no bounds. Since being elected to the Sierra Club's board of directors in 1957, Wayburn's reach as a conservationist has widened along with his vision. "Whereas 45 years ago the setting aside of special parcels of land was absolutely necessary, 10 or 15 years later there were bigger issues than just the land. Pollution of the air we breathe and the water we drink were becoming extraordinarily important."

Wayburn is the first to admit that many of his goals have yet to be accomplished. While he was instrumental in writing the Alaska National Interest Lands Conservation Act of 1980, which designated over 100 million acres as national parks, national wildlife refuges and wilderness areas, this work is hardly complete. In 1969 Wayburn testified against the TransAlaska pipeline, and he has continued to protest drilling in Alaska. Naturally, he does not mince words when he speaks of the Exxon Valdez oil spill.

"That disaster caused more damage to more land and more people than any other spill in the history of America. The slick has spread to 1,100 square miles and has covered 700 miles of shoreline. The spill caused a lot of people to change their minds about the benefits of getting oil from Alaska." Yet, Wayburn refuses to give up hope, and continues to lobby against oil drilling in the Arctic National Wildlife Refuge.

Politics are just a necessary part of conservation work for Wayburn, who has had the ear of the Kennedy administration, presidents Nixon and Carter, of congressmen, senators, state representatives and other government officials. "The politics of the environment are . . . mixed up with the politics of the economy and are suppressed whenever they come into conflict. President Bush's theory is that as long as it doesn't interfere with good economics, it's okay. But environmental politics are long-term and economics are short-term."



*"... I have always
had a feeling for
places of beauty."*

—EDGAR WAYBURN

Over the years, Wayburn's separate but equal practices of internal medicine and conservation have grown closer. "While medicine has conquered certain communicable diseases, we have been defeated on others—cancers found among chimney sweeps, cigarette smokers. . . . No matter how effective a drug may be in curing a disease, if there are too many side effects, we abandon it. We haven't done that where the environment is concerned. People think getting a little more gold, a little more oil out of the earth is alright. But it isn't."

There are thousands of physicians in the Sierra Club. Why so many? "Doctors have as their first precept the helping of humans, and a healthy life is personified by the outdoors. It is natural for physicians to follow the Sierra Club. In 'the olden days'—as my children referred to the 40s, 50s and 60s—I personally sponsored about 500 doctors into the club. I'm glad to see that doctors, who have more of a schedule to meet than most people, are taking more responsibility in the club."

As for Wayburn himself, he hasn't slowed down in the least. He continues as director of the Sierra Club, is chairman of the club's Alaska Task Force and vice president for National Parks and Protected Areas. He is working on

bills to study the boundaries of the parks, and to make the National Park Service an independent agency.

Wayburn also serves as a member of the Sierra Club's International Committee on Population Stabilization. Gaining control over population growth on an international level, says Wayburn, would solve many of our environmental problems. "No matter what we do to designate special areas, as long as we continue to expand the human population to 'standing room only' in the more desirable places on the earth, we crowd out those special places."

As for his immediate family, Wayburn says, "We tried not to influence our children in their choice of careers." Nonetheless, two out of four children work in the environmental field. No doctors. His wife, Peggy, is an author. Daughter Cynthia is a trustee of the Sierra Club's Legal Defense Fund, and a former president of the Aspen Environmental Center. His youngest daughter, Laurie, went to Nairobi in the United Nations Environmental Program, and to Paris and South America to do UNESCO work. She's now executive director of the Point Reyes Bird Observatory and works with the Central California Coastal Biosphere Reserve.

Wayburn says the 20th anniversary of Earth Day was highly symbolic. But most significantly, the celebration interested a great many people in the problems of environmental health. How did he celebrate Earth Day? "Giving grand rounds at Pacific Presbyterian Medical Center on the relationship between human health and environmental health."

Along with younger environmentalists, Wayburn feels that the earth is approaching a crisis state: "We can't afford to dally as we have been dallying," he says. "Earth's environment will endure. It's the environment of mankind that's at stake. It's the quality of human life."

He says that he's not so much worried that the earth is changing, but the speed at which it's changing. "Changes that used to take place over 1,000 years now take place in a decade."

How, in the midst of all of this, does he avoid despair and cynicism? "I have to be a perennial optimist, despite cold facts staring me in the face." As he describes himself: "Once I take hold of a project it's awfully hard to let go. . . . I have that quality of persistence that has kept me going for 44 years." □

Sarah Jane Nelson is editorial assistant for the Harvard Medical Alumni Bulletin.

ILL WINDS

Air Quality and Health Effects

The smell of the stagnant, foggy air was choking. After only a short walk outside, dirt clung to skin and hair. With visibility near zero, transportation came to a halt. In the aftermath of the London Fog of 1952, 4,000 people were dead.

That kind of killer air pollution probably couldn't happen in Great Britain or the United States today (though it is conceivable in parts of Eastern Europe). Coal-burning is not as prevalent now in the West and there has been some environmental clean-up. But a culprit that many environmental scientists now realize played a major role in 1952—acid aerosols—is still very much in evidence and is unregulated. The Six-City Harvard Study of Air Pollution and Health has turned up high levels of airborne acids, even in rural areas, and has found that acid aerosols may be even more damaging to lungs than the primary pollutants from power plants—sulfur and nitrogen oxides.

Acid aerosols are the precursors of acid rain, and are formed when the sulfur and nitrogen oxides mix and photochemically “cook” into sulfuric and nitric acids. “We hear a lot about the effects of acid rain on the physical environment, but there is very little data on the health impact of acidic air pollution on people,” says Frank E. Speizer, MD, who is co-director of the medical school's Channing Laboratory, profes-

by Ellen Barlow

sor of medicine, and professor of environmental science at the Harvard School of Public Health.

Speizer has been involved with the Six-City Study since its inception in 1974. As his colleagues at the Harvard School of Public Health continue to analyze the wealth of other data the study has generated, Speizer has taken on another study to find out more about these preliminary findings on acid aerosols. The Six-City Study has begat the 24-City Study.

Speizer is principal investigator of a study on acid air pollution, comprising 24 cities in the United States and Canada. U.S. and Canadian collaborators are correlating the levels of acid aerosols in the air and the pulmonary function of schoolchildren ages 7 to 11, to assess the impact of chronic exposure to these acids on respiratory health.

These studies are important to federal and state agencies such as the Environmental Protection Agency (EPA) in determining which substances are toxic and need to be regulated. The EPA has set National Ambient Air Quality Standards, maximum allowable levels, for “criteria pollutants”—carbon monoxide, sulfur dioxide, nitrous oxide, ozone, hydrocarbons and particulates (dirty

particles in the air)—which have been determined to have effects on health. Benzene, lead and asbestos are considered toxic at any level.

By law these standards are reviewed every five years. Though no *one* study has the power to change the standards, data from the Harvard Six-Cities Study have been used by the EPA to revise allowable levels for sulfur dioxide and particulate levels, and are currently being used to review levels for nitrogen oxides.

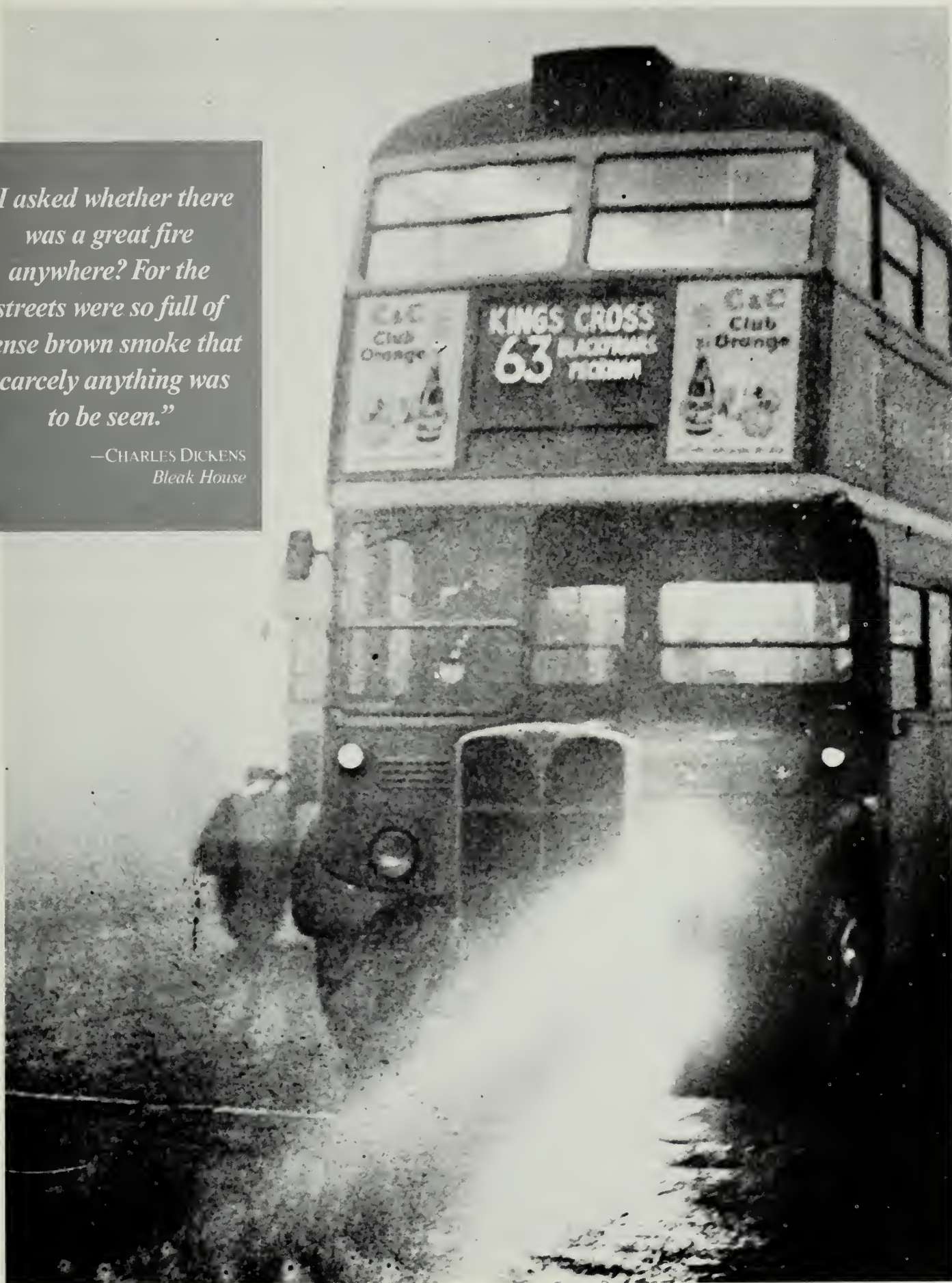
It was the pollution disasters in the middle of this century—London in 1952 and other tragedies in Donora, Pennsylvania in 1948 and Meuse Valley, Belgium in 1930—that prompted investigation into health effects of less acute, but chronic exposures to pollutants. Now a scientific base of information has been amassed through epidemiological studies of free-living populations, clinical studies of controlled exposures to humans, and animal toxicology.

Benjamin G. Ferris '43B—who is now an *emeritus* professor of environmental health and safety at Harvard School of Public Health—pioneered in the United States the concept of extended, epidemiological study of respiratory health in communities. In 1961 Ferris began a longitudinal study of the health effects of sulfur produced by paper mills in Berlin, New Hampshire.

A surprise to many at that time,

*"I asked whether there
was a great fire
anywhere? For the
streets were so full of
dense brown smoke that
scarcely anything was
to be seen."*

—CHARLES DICKENS
Bleak House



cigarette smoking turned out to cause greater damage to respiratory health than air pollution. Even so, respiratory health was worse in the more polluted parts of town. It also appeared, says Ferris, that a reduction in air pollution levels led to improved lung function. "People are pretty tough—there has been no increased mortality due to sulfur that we can detect."

Berlin, in a sense, spawned the Six-City Study in 1974. With the oil embargo and an energy crisis at hand, and the use of more coal anticipated, Congress called for a study to assess the impact of increased sulfur dioxide emissions from burning coal. Congress turned to Ferris, who along with Speizer, proposed that the effects be studied in six cities with varying amounts of air pollution: Steubenville, Ohio and St. Louis, Missouri—which exceeded National

Ambient Air Quality Standards; Portage, Wisconsin and Topeka, Kansas—both below standards; and Watertown, Massachusetts and Kingston, Tennessee—which had moderate amounts of pollution.

The air in each city was monitored continuously for pollutants; for 15 years the pulmonary function of 8,842 adults was tested every three years, and the growth in respiratory function of 14,357 children was recorded yearly from first grade through high school. Data collection was completed in 1989.

Though analysis is not finished, there has been a wealth of findings on cigarette smoking, indoor and outdoor air pollution, and the growth of children. For example, the study showed two to three times more respiratory illness in the polluted areas, controlling for cigarette smoking.

"There's been a certain amount of clean-up here and in Great Britain," points out Ferris. "But as the Six-City Study showed, it takes only low concentrations of pollutants to cause respiratory symptoms." Symptoms include coughing, bronchitis, chest illness, and in those susceptible, more asthmatic attacks.

The full significance of these symptoms is not yet known. "We are now looking for any permanent effects in

the growth of the kids, or to diminished lung function in adults that we can attribute to air pollution," says Douglas W. Dockery, DSc, who is now the principle investigator of the Six-City Study. Dockery is an assistant professor of medicine at HMS and associate professor of environmental science and physiology at HSPH.

Because it was expected that pollution levels might change in the six cities over the 12 years, the study was designed to look longitudinally at changes in the same individuals over time, and not solely to compare across communities. The differences in air pollution among the communities did in fact stay about the same, though the cleanest communities got a little worse and the dirtiest—St. Louis and Steubenville—got better, largely because the steel industry had shut down in those cities.

Acid aerosols are one reason why the cleanest communities have become more polluted. "We've seen clean-up of air quality near the industrial/urban sources," says Dockery, "but that was often accomplished by building taller stacks that put the pollutants higher up in the atmosphere." That has promoted the chemical reactions that produce the secondary species of pollutants—the acid aerosols. These pollutants form over hours to days and are in the

Acid aerosols may be even more damaging to lungs than the primary pollutants from power plants—sulfur and nitrogen oxides.



PHOTOS © 1990 BY FRANK S. BALTHIS

meantime blown downwind over long distances.

"So we're seeing more pollution in the non-industrial areas with what we think are more irritating substances," says Dockery.

At first it was a puzzle why, for instance, childhood bronchitis rates in rural Kingston, Tennessee were 50 percent higher than those in St. Louis and 25 percent higher than in Steubenville, Ohio. Originally monitoring had not turned up substantial concentrations of the criteria pollutants in Kingston's air. But in the mid-1980s the researchers began measurements with a more specific device to record acid aerosol levels, developed by John Spengler and colleagues at HSPH. They then discovered that acid levels in Kingston were more than twice as high as St. Louis and almost as high as in Steubenville.

Now, with a direct method to measure airborne acidity, the health effects of acid aerosols can be further assessed. The more sophisticated monitor was critical, says Speizer, because exposure to acids in the past was only estimated or assumed by the presence of certain other toxic agents in the pollution mix. Although it has been suggested that sulfuric acid was the component most responsible for the extreme effects of the major episodes, there were no measurements of airborne acids taken.

There were many clues pointing to the culpability of acid aerosols, however. No one understood at first why only the prize bulls at London's Smithfield Fair in the 1952 pollution episode either died or had to be slaughtered. "It turns out that the pens of the prize bulls were cleaned every hour," says Speizer. "The urine and feces collected in the pens of the other bulls and created ammonia, which neutralized the acid and protected them."

The ultimate purpose of the new 24-city U.S./Canada collaborative study is to provide the basis for establishing a standard, maximum allowable level for acid aerosols. The investigators thus far have monitored the air of 16 of the 24 communities for one year to characterize exposures to acid aerosols, ozone, sulfates and nitrates. They have also begun to question the parents of a total of 8,000 schoolchildren about their home environment—length of time living in same county, parents' smoking habits, cooking fuel, and parents' and child's disease history. The children are then given pulmonary function tests to assess respiratory health.

"We are looking particularly at children with symptoms of airways reactivity," says Speizer. Evidence suggests



that acid aerosols can cause bronchoconstriction in people with compromised respiratory function, such as asthmatics. There is also some evidence that repeated exposures can also cause hyperreactivity of the airways in people with previously normal function.

Airway reactivity may be one of the risk factors for respiratory disease later in life. A big question has been why only 20-40 percent of cigarette smokers get into respiratory trouble. One hypothesis, says Speizer, is that some people have more reactive airways than others—they don't have overt asthma, but are more sensitive to pollutants.

Another hypothesis is that pollution exposures early in life establish a child on a lower track of pulmonary function growth. Everyone's pulmonary function tracks in a consistent growth and decline pattern, reaching a peak of pulmonary function in early adulthood and then decreasing gradually. Children with early exposures may never reach 100 percent of their maximum pulmonary function potential, and then track the rest of the way through life at a lower functional level. Cigarette smoking or other pollution exposures then lower function further, leaving these people susceptible to illness and early death.

A key question in plotting the natural history of environmental lung disease, says Speizer, is: How do risk factors influence respiratory illness and do they lead to respiratory disease and premature death later in life? He points to a host of possible risk factors—passive smoking, asthma, occupational expo-

"... it takes only low concentrations of pollutants to cause respiratory symptoms."

sures, air pollution and respiratory illness in childhood. Ideally people should be tracked from cradle to grave to trace the effects of these risk factors, but since that is rarely possible, epidemiologists cover the span of ages in 10- to 15-year longitudinal studies.

The work of Ferris, Speizer, Dockery and their colleagues has already been of critical use in national debates on pollutant standards. But says Dockery, "We try not to take an advocacy view. Our job is to gather the scientific facts." He has learned that bureaucracy is slow and cumbersome, and that changes sometimes take 5 to 10 years, even though to him, "the relevance of some of these results is more immediately apparent."

Fortunately, as Ferris points out, there's a different consciousness today. Clean-up is expensive, but people are more vocal about wanting it. "It's much easier to go into industry or communities today and study these things than it was 30 or 40 years ago." □

Ellen Barlow is managing editor of the Harvard Medical Alumni Bulletin.

Oil Spill

For days following the Good Friday crash of the Exxon oil tanker off the beach of Prince William Sound, attention was focused on this isolated stretch of beach in Alaska. Television screens across the nation aired images of oil-covered birds, otters and other wildlife, beside miles and miles of black rock and ocean. In nearby Valdez, Andrew Embick '77, who is a partner in the Valdez Medical Clinic, felt firsthand the impacts of this ecological disaster.

The small town of Valdez, Alaska—population under 5,000—was inundated with 14,000 people within one month. There were media, Exxon managers, and scores of people hired by Exxon to clean up the sound.

People from all over Alaska flocked here for the \$19-\$20/hour jobs removing oil from the beaches, says Embick. In addition, the relatively quiet bay was flooded with a fleet of roughly 2,000 ships and boats, "from the smallest inflatable up to the largest U.S. Navy assault ship." The result, says Embick, is that Valdez felt itself under a "virtual invasion."

What this meant to the two-physician Valdez Medical Clinic was an admissions roster of 17,000 over the five and one-half month span of clean-up. Ten new physicians were hired to help out: the clinic hired four, two came from the navy, the Public Health Service and Exxon each sent one, and two were hired by sub-contractors. Everyone worked day and night for at least 67 days straight, Embick says, yet there was barely enough help.

A lot of that time was spent treating sprained ankles and similar injuries, mostly from people falling on the slippery, oil-covered rock. To further complicate matters, patients came in covered with crude oil, which, according to Embick, is "really messy, gunky, yukky stuff." So each patient had to be cleaned up before the injury could be treated.

An exceptionally large number of people with upper-respiratory infec-

tions—bronchitis and pneumonia—came into the clinic as well. "We saw more of those cases than we would normally see in 10 years," says Embick.

The reason he cites is that cruise ships and navy tankers served as "floating hotels" for the clean-up workers. Living quarters were extremely close and rows and rows of bunks, sometimes as many as eight high, created express routes for one virus after another.

A need for noise-reducing earmuffs became necessary because of a drastic increase in patient deliveries made by helicopter, from roughly two a year to two, sometimes four, helicopter deliveries a day. This effort was hampered by a gravel driveway—finally paved halfway through the summer.

A lack of radio communication between air and ground forced emergency personnel to listen for the whop, whop, whop of helicopter blades to know when a patient was coming in, "just like Radar's sixth sense from 'MASH'."

The entire experience has left Embick with some sound environmental advice: "We should all use less oil." The responsibility for the spill, he argues, does not entirely lie with Captain Hazelwood, or even Exxon. "A major oil spill was inevitable" because of the large quantity of oil being transported. The responsibility for such a catastrophe "belongs to those who use petroleum products." □

—Terri L. Rutter



Sea otters killed by the oil spill in Prince William Sound are bagged for transport to an animal morgue in Valdez. AP/WideWorld Photos.



CHASING WINDMILLS

Post-Earth Day Solutions

by David Roe

If Earth Day back in 1970 was responsible for adding a controversy called "environmentalism" to our public discourse, then Earth Day this year may eventually get credit for removing it.

The hard issues of environmental protection have not gone away, of course, and Earth Day this year did not show that environmentalism has either succeeded or failed to meet its goals in practice. But it did prove how non-controversial environmentalism has become in theory, and how widely the label has been embraced. Even the likes of oil, automobile and chemical manufacturing companies sought to associate themselves with the 1990 Earth Day festivities.

President Bush is an announced environmentalist. So is President Gorbachev. So is the Pope.

In short, "environmentalism" seems to be on its way toward "medicine"—as a pursuit almost universally approved in concept, for which the ostensible policy questions are no longer "why" but "how." Within it there are innumerable complex and potentially painful decisions that still have to be faced, political pressures to be felt, and mistakes to be made—but the legitimacy of the effort is not in doubt.

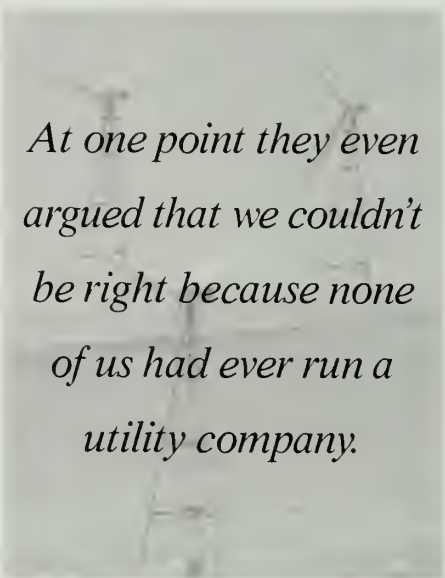
Earth Day this time around made one other key point: solutions have not kept pace with problems. The rate of progress achieved over the last 20 years by the government's pollution control efforts has not been adequate even for the familiar, domestic problems at which those efforts were aimed—such as smog and hazardous waste—much less for more recently discovered threats like ozone depletion, rain forest destruction and global warming.

Incremental improvements in the existing system, through fine-tuning and loophole closing, won't be enough. Quantum leaps are essential. But how? Even if enough public support is there, where will the ideas and the mechanisms for major change be found? And what will overcome multiple layers of institutional inertia? For environmentalism, these are the central post-Earth Day concerns.

My own nearly 15 years of work as a professional environmentalist makes me suspect as a chronic optimist, at least, if not confirmed as a terminal Quixote. But it seems to me, from several sets of experience on particular issues, that there are glimmerings of answers—mechanisms for accomplishing positive change that have only begun to be explored.

One example shows up on the cover

of a recent issue of *Fortune* magazine, where the chief executive of Pacific Gas & Electric Company, one of the country's largest public utilities, is posing in a forest wearing a bright red parka and a sunny smile, celebrating his success in *not* building power plants. The accompanying story makes much of the company's willingness to listen to environmentalists, and its investments over the last decade in windmills, conservation technologies, and other non-conventional sources of electric power that have spared major damage to the environment.



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utility company.*

What makes the story interesting, however, is what doesn't appear on the pages of the magazine. PG&E in the late 1970s was firmly committed to plans that would have added 10 giant new power plants (either coal- or nuclear-fired) to the California landscape. Without them, the company claimed, it would run out of electricity and would not be able to meet its customers' needs.

According to the schedule, six or seven of those plants were to have been up and running by now, and the rest far along in construction. Instead, today, not one of those plants has even been started, and the company has no plans to try. In the meantime it has been meeting customer needs handily, in part by putting well over \$1 billion into conservation efforts and other low-impact energy sources. Though PG&E still operates the conventional plants it had before, (including the much-publicized Diablo Canyon plants), its growth behavior since 1979 represents an abrupt change from the "growth-equals-power plants" assumption that has driven the electric power industry for most of a century.

The company's counterpart in the Los Angeles area, Southern California Edison, performed a similar turnaround at the same time, investing even more quickly and more heavily in the same nonconventional options as a preferable alternative to large-scale power plants. In fuel terms alone, the results are eye-opening. One expert has calculated that if every utility in the nation had followed the same path as California's over the past 10 years, the United States would not now have to be importing a single drop of oil for electricity generation.

Most surprising is that the change occurred despite, rather than because of, the company's own vision of its future. Beginning in 1977, a small team of experts led by an economist at the Environmental Defense Fund started analyzing PG&E's expansion plans. They built a computer model and put together a proposed alternative plan that would produce the same yield of electricity for customers, over the same time period, but would cost half a billion dollars less.

The plan used a mix of conservation and alternative low-impact sources to substitute for future nuclear and coal plants, but it represented no cutback in service or profit. The company did not need to care at all about the environmental benefits to find the alternatives attractive. In other words, the half-billion dollar savings was a direct appeal to PG&E's economic self-interest.

As the team's newly arrived lawyer, my job was to try to make the alternative plan stick by getting the government commission responsible for supervising utility companies to order PG&E to follow it. Needless to say, the commissioners had never heard such presumption before, much less grappled with a complex economic analysis that compared coal plants to windmills, and they were not eager to listen.

PG&E first ignored our analysis, then for years fought bitterly against it as we pressed our case. The company attacked each calculation and technical detail, spending most of one year just trying to find flaws in the computer model. At one point they even argued that we couldn't be right because none of us had ever run a utility company.

Eventually, however, despite the blatant heresy of what was being proposed (not to mention who the proposers were), the soundness of the economics and the technical viability of the alternatives started to sink in. First PG&E was given a small but unprecedented fine for ignoring cheap energy alterna-



A field of windmills generates electrical power for Pacific Gas & Electric in California.

tives. Then a year later, an updated version of our economic analysis was instrumental in blocking permission for what would have been the nation's largest new coal-fired power plant—a \$5 billion project sponsored by both PG&E and Southern California Edison. By then the winds of the utility business were starting to shift, and California's utility companies had learned to recognize the new direction.

For the last few years, both PG&E and Southern California Edison have routinely leased the Environmental Defense Fund's computer model to help with their internal planning. The only news on the *Fortune* magazine cover is that PG&E's chief executive is smiling.

The point of this example, now more than 10 years since PG&E's initial reaction of disbelief, is two-fold. First, alternative solutions to what had seemed to be a no-win dilemma—environmental damage versus energy shortage—were available on a much larger scale than nearly anyone had thought possible, including all the experts who were closest to the problem. No new technology or breakthrough invention was needed, only a new perspective on what was already there. PG&E and its California

confreres have not come close to developing the full potential for alternatives that are available, in part because they haven't had to. And utilities in the rest of the country, with very few exceptions, haven't even begun to scratch the surface.

Second, the heart of the change was economic. Instead of representing a compromise between productivity on the one hand, and environmental protection on the other, the Environmental Defense Fund's set of alternatives could enhance both. Protecting the environment has so often been cast as an issue of cost (most memorably, perhaps, as David Stockman's "\$6,000 per fish") that all of us tend to think in tradeoff terms: How much will it cost to get toxic chemicals out of the drinking water? How much can we (or should we) spend for clean air?

Often these questions need to be asked. But it is crucial to recognize when they *don't* need to be—when major improvements *reduce* costs as well as potential environmental damage.

The reason is obvious, but often overlooked. If extra cost is the assumption, then automatically the instinct is to shrink from considering large-scale change. Reluctance and compromise are part of the atmosphere from the begin-

ning, long before the facts of a particular case actually come into view. Everyone is wary of writing a blank check for environmental protection—business, government and taxpayers alike.

However, if the potential is for cost savings, then the atmosphere should be entirely different. The larger the scale of change, the better. How far a potential solution can go becomes a question to be enthusiastically explored, rather than shirked. And when obstacles occur, as they do in any new activity, the incentive is to overcome them rather than simply hold them up as excuses.

Instinct says there are no such opportunities, but reality keeps turning out to be different. Hazardous waste is a classic example of what's been assumed to be a no-win situation. Old disposal was cheap but created some nightmarish problems. New disposal is much more expensive, full of technical and legal difficulties, and still doesn't guarantee protection of the environment.

In 1987, however, one of the country's largest oil companies, Chevron, announced that within five years it would be able to reduce the amount of hazardous waste it created by 65 percent worldwide, and save millions of

dollars in the process. In other words, some two-thirds of the hazardous waste disposal problem, from one of the largest waste-generating industries in the world, was literally unnecessary. Not only could that much of the need for disposal be eliminated, but at a cost of less than zero (i.e., at a profit), according to one of the industry's own leading members. Assuming that Chevron's numbers are sound, what could be an easier policy priority than seeing to it that every oil company accomplishes such reductions in short order, and looks for more?

In this past year, Monsanto announced a corporate goal of zero toxic air emissions from its plants, with a reduction of 90 percent by 1992. Du Pont has pledged a zero-discharge target for all forms of chemical waste. The stimulus in both cases was simple: a 1986 federal law that required companies to disclose the amounts of toxic chemicals they were discharging into the environment. The numbers turned out to be large, and many companies, for the first time, took a systematic look at how to make them smaller. Monsanto and Du Pont were two that decided they could go all the way. Again, the scope of potential improvement for the environment that is consistent with economic health in industry has been dramatically redefined.

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These examples and others do not suggest, by any stretch of the imagination, that environmental problems have been conquered, or even that the promises of these specific companies will be fully kept. But they do show how much more tractable the problems can look once they are seen through the lens of opportunity rather than burden. Like

PG&E, these companies and their kin had fought bitterly against pollution-control proposals with much less ambitious targets, insisting that the means did not exist. Now a few of them are part of a large-scale experiment to prove otherwise.

When everyone claims to wear the environmentalist label, it does not mean that environmental issues have become any easier to solve; it means only that labels cannot be much of a guide in trying to find where solutions may lie. Change on the scale that's needed will come, if at all, from being able to mobi-

lize a new perspective on familiar problems, and to recognize the much larger potentials for improvement in what is already there. □

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David Roe (left) and environmental engineers from Southern California Edison meet to discuss how to recycle toxic waste.

PIPELINE DISASTER

Treating Soviet Burn Victims

Russia looked like it was supposed to look. Making our final approach to Sheremetyevo Airport, with noses glued to the windows, we could see the countryside below. In the winter dusk of late January, it was all snow and forest. Large stretches of dim, snowy fields alternated irregularly with dark tracts of forest punctuated by occasional pinpoints of light.

It was my first visit to the Soviet Union. I was one of four sent by Project HOPE to seek out children in Armenian hospitals with unhealed injuries from the December 1988 earthquake. That quake, registering 6.9 on the Richter scale, claimed over 25,000 lives and devastated a large section of northwest Armenia, most of which remains in ruins to this day.

With over 30 years of international experience in medical education and relief, Project HOPE wanted to identify children who could be better treated in the United States. Ultimately 37 children, and a like number of parents or guardians, were transported to eight U.S. hospitals, including the Massachusetts General Hospital. The children

by John P. Remensnyder Jr.

returned to their native Armenia as they healed, the last returning mid-summer 1989.

On our first morning in Yerevan—the capital of Armenia and sister city of Cambridge, Massachusetts—the sun rose through a brown-gold haze disturbingly reminiscent of some of Los Angeles's worst days. An hour later, looking from the front entrance of the Nor Marash Traumatology Institute, perched high on a ridge east of the city, we realized that Yerevan was set in a natural bowl so filled with smog and pollution that none of the large buildings of this city of 1.5 million people were visible. To the south—a scant 30 miles away in unapproachable Turkey—lay Mt. Ararat, serenely snow-covered and soaring 17,000 feet high. The contrast was jarring.

During this visit to the Soviet Union, pollution, largely derived from gas and oil products, was only an inconvenience to us. Five months later, however, again in the Soviet Union, I came face to face

with the tragic victims of uncontrolled pollution of a very different sort.

Late in the evening on June 3, 1989, two trains were travelling in opposite directions on the Trans-Siberian railroad. They were due to pass each other somewhere in the autonomous western Ural mountain region of Bashkir. Both trains had been delayed.

The train travelling west, carrying Siberian children and their families bound for vacations at Black Sea resorts, had been held up by a young mother's active labor, for which she was removed from the train. The eastbound train was delayed for mechanical reasons. Underway again, the two trains rushed towards each other as they entered a huge natural bowl, five miles across, in a remote forested area between the cities of Ufa and Asha.

A large natural gas pipeline abuts the railroad track as it crosses through the Urals. The pipeline had been leaking gas into the forested bowl for at least 24 hours prior to the arrival of the trains. Technicians had noted a drop in pipeline pressure, but their only response had been to increase pumping



John P. Remensnyder poses with staff and burn patients at Childrens Hospital #9 in Moscow.

pressure to offset the drop. Heavy fumes filled the bowl. An errant spark from one of the trains was all it took to ignite the gas.

The force of the explosion was estimated by Soviet military experts to be the equivalent of 10,000 tons of TNT—half the force of the Hiroshima bomb. It demolished both trains and a large section of the railroad, and instantly killed 300 of the estimated 1,200 passengers. The extent of the destruction was awesome. Thirty-eight train cars and two locomotives were destroyed. Trees were leveled in a five-mile radius around the disaster sight, and windows were blown out in Asha nine miles away.

Helicopters from a nearby military training base air-lifted survivors to hospitals in the industrial cities of Ufa, Asha, Gorki and Chelyabinsk. Three days after the catastrophe, 272 were still missing and over 700 people had been admitted to hospitals. Aeroflot, the Soviet national airline, organized a special series of flights that evacuated 160 of the most severely burned to hospitals in Moscow. Thirty-seven of those evacuated were children. Among them, 27 were admitted to the Soviet Union's only major children's burn center at Childrens Hospital #9.

Requests for help came directly from Soviet President Mikhail Gorbachev, Minister of Health Evgeni Chazov and Armand Hammer, chairman of Occidental Petroleum. Hammer, who happened to be in his Moscow office at the time of the explosion, contacted Allen J. Collins, MD, a renal dialysis special-

ist in Minnesota, who went immediately to the Soviet Union to survey the situation.

After examining burned children in several hospitals, Collins concluded that specialists in pediatric burn care were badly needed. Two teams were immediately assembled.

The first, under the auspices of the U.S. State Department's Office for Foreign Disaster Assistance, was led by David Herndon, MD, chief of staff of the Galveston Shriners Burns Institute. He was joined by Thomas Rutan, a nurse at the Galveston Unit, Susan Briggs, MD, assistant chief of staff of the Boston Shriners Burns Institute and Kurt Reinke '86, surgical resident at the Massachusetts General Hospital. They proceeded directly to Ufa and during the succeeding week, performed over 40 operations on 21 children with burns covering up to 55 percent of their body.

I was asked to form a second team to help take care of the children at Childrens Hospital #9 in Moscow. Our team travelled under somewhat different auspices: Project HOPE and the International Physicians for the Prevention of Nuclear War (IPPNW). In addition to myself, this team consisted of Frederick Ackroyd, MD, visiting surgeon at the Massachusetts General Hospital, and Cherie Tuohy and Patricia Salvo, both experienced burn nurses from the Boston Shriners Burns Institute. We arrived June 17, 1989, two weeks after the disaster, and worked at the hospital until July 2, 1989.

Project HOPE sponsored our team with the understanding that the Soviet Ministry of Health would provide transportation, airport visas upon our arrival in Moscow, lodging, daily maintenance and translators. Project HOPE provided substantial medical and surgical supplies, and delivered over seven tons of supplies while we were at Childrens Hospital #9.

True to their word, the members of the Soviet Ministry of Health had our entry visas waiting for us at Sheremetyevo Airport. Olga Pisareva, our translator assigned by the ministry, escorted us through customs and drove us into Moscow in a hospital ambulance. There she shepherded us through the somewhat mysterious process of securing our rooms at the Hotel Rossiya—the largest hotel in the world, accommodating a polyglot total of 5,300 guests each night.

From its west entrance, the Rossiya looks directly onto the famous multi-onion-domed St. Basil's church and Red Square—a daily sight for us as we were picked up each morning by the reliable Sergei, who drove the hospital director's Volga sedan. Moscow regulations permit only four to a car, so one of us had to disappear each time we approached one of the military-looking traffic police.

Olga met us at the hospital each day and accompanied us constantly for the next two weeks—in the operating rooms and out. She provided not only invaluable translation, but also kept us informed of the wider meaning of the manifold aspects of our visit and activi-



Aida Buletova, senior pediatric surgeon.

ties. We rapidly learned the difference between a single translator and the more critical interpreter.

Childrens Hospital #9—located near one of the western bends of the Moscow River at Schmidtkovsky proezd., 29—contains 1,000 beds. It has all the specialties one would expect in a large, general, pediatric hospital responsible for the care of over one-third of Moscow's children. Overall, the hospital consists of several buildings of various ages, the oldest of which dates from the early 19th century and was originally an old people's home. An attractive neoclassical mansion, now housing the director's offices, is reputed to have been a well-known bordello in Tolstoy's time. The surgical clinics are all gathered in a relatively modern nine-story building, which also houses the 90-bed children's burn unit. This unit is the only such facility in the Soviet Union, and receives patients from all 15 of the Soviet republics.

Peter Prodeus, MD, director of the hospital, and Valentin Okatyev, chief of surgery, cordially met us our first morning at the hospital. They immediately introduced us to the six staff burn surgeons, four of whom were women. Ludmilla Budkevitch ran the ward for burned children under the age of three, and Aida Buletova managed the ward for older children. Sergei Vozdvidzensky, senior burn and plastic surgeon, lent seasoned advice and experience, and proved to be a marvelous raconteur of personal and historical vignettes of his long, colorful life.

Initial reserve disappeared quickly as we joined our Russian colleagues for the day's round of burn dressings. By their questions and actions, it soon became apparent that we were expected to have primary responsibility for the care of their patients for the next two weeks.

The process of question, advice, consultation and decision during that time was lively, efficient and to the point, and yet always marked by mutual courtesy, cooperation and good humor. We came to understand that prompt decision-making characterized our Soviet colleagues' approach to clinical problems. Remarkably, during our two weeks of working intensely and closely together, we never discerned a cross word or major negative feeling between our two groups.

The daily routine settled in: rounds on the patients in the ICU ("Reanimation Unit") upon arrival each morning; breakfast, which varied from fried fish and onions to ham and eggs, presided

over by Sasha Avramenko, Okatyev's administrative assistant; burn dressings under anesthesia and operating room procedures; a hearty dinner at 3 PM, again provided by Sasha; and finally, conference and rounds together to review the patients and plans for the next day.

Our advice was also sought about other burn patients, as well as children with reconstructive problems and deformities, but the burned children remained our central focus. We came to know not only the children, but their parents as well, since parents stayed with their children constantly. Sadly, not every child had a parent—some had been killed instantly in the blast.

Both fathers and mothers provided much of the children's care. When parents were missing, others acted as surrogates. They fed their children, changed

who we were and what our relation was to the hospital and to their children. This and successive sessions did much to dispel their anxieties and to assure them of our concern for their children.

The 26 children under our care—one had died the day before we arrived—varied in age from three to four years of age, and almost all were from towns and cities in the region of Siberia, just east of the Ural Mountains. Their burns covered 22 to 80 percent of their bodies, much of it full thickness injury requiring skin grafting.

A curious burning pattern was evident in over half of the children. The deepest and most extensive burns predominated on the right side of their bodies—most assuredly due to their place in the railway car in relation to the fireball. At least four of the chil-



Sergei Vozdvidzensky, senior burn and plastic surgeon at Childrens Hospital #9 in Moscow, and a child burned in an explosion caused by a leaking pipeline.

beds, washed clothes, transported their children around the hospital and received them directly from the operating rooms still partially anesthetized. Clearly, the children received the beneficial effects of parental involvement in virtually all facets of their care—something we in U.S. hospitals could perhaps learn from.

Particularly poignant for us was a parent meeting held two days after our arrival. The staff gathered all the parents together in the recreation room on the older children's floor and we were each introduced. What followed was a frank, direct and sometimes sad question and answer session. Clearly the parents were concerned about exactly

dren suffered pulmonary injury requiring ventilator support. At the time of our arrival, six were still in the Reanimation Unit, and four of them were being treated every other day with plasmapheresis to reduce circulating burn toxins.

Only one child succumbed. During our first day, a five-year-old girl died of what appeared to be invasive streptococcal infection. During the two weeks we were at Childrens Hospital #9, we performed 140 procedures under anesthesia, and when we left, virtually all the children were healing.

The approach to burn care by the surgeons at Childrens Hospital #9 varies markedly from what we are used to



practicing in Boston. In Moscow physicians rely heavily on periodic burn dressings with topical antibiotics for two or three weeks, allowing as much spontaneous healing as possible to occur. At the end of that time, remaining unhealed areas are grafted using very thin skin strips expanded as a wide mesh, thus covering as big a wound area as possible with minimal skin.

In Boston, our very aggressive approach is based on surgical removal of all the destroyed skin within the first 24 to 72 hours of the burn. The excised areas are then covered with meshed autografts, or with a temporary coverage until the patient's own skin again becomes available for autografting.

At the time of our arrival two weeks after the accident, virtually all of the children still had infected, undebrided, burn-damaged tissue (eschar) with some healing of the areas that had sustained only partial thickness injury. Our approach was to blend the two philosophies: expedite the removal of residual infected eschar, and graft as soon as possible.

Virtually all the undebrided wounds showed a potentially murderous combination of *Pseudomonas aeruginosa*, a highly resistant *Staphylococcus aureus* and *Enterobacter cloacae*. All the children had the same combination of organisms because of a relatively loose approach to infection control. Additionally, they were anemic, hypoproteinemic and had lost significant amounts of body weight.

By intensifying dressing and debridement schedules, as well as introducing the use of dilute epinephrine solution for the control of bleeding, the wounds assumed a healthier appearance with minimal drainage, presented a dry surface and readily accepted skin grafts.

We introduced two methods to rapidly remove large skin grafts and reliably cover residual unhealed burns by using the free-hand Watson skin graft knife or mechanical, air-driven oscillating dermatome. In each instance, I taught one surgeon one of the techniques with the promise that she would instruct the others after we left. On a subsequent visit we found that such peer teaching had been quite effective.

Our Russian colleagues were used to using small grafts at repeated sessions, thus unnecessarily extending the burn illness. They feared any technique that entailed significant blood loss because of the extreme difficulty of securing blood transfusions in the Soviet Union. The use of topical dilute epinephrine (1:750,000) not only reduced blood loss on debrided and excised surfaces, but also on skin graft donor sites—going a long way to make our colleagues feel comfortable with our techniques. During the two weeks we were there, only one child received a transfusion.

Memories crowd in on me as I write. I think about how we developed our own sign and body language, as well as some primitive pidgin Russian, to communicate in the burn dressing

and operating rooms. I remember the slow cadence of giving a lecture on burn care, during which I had to pause after each sentence for translation.

I remember that my jet lag was so bad that I spent every night the first week wide awake from 1:00 to 4:00 AM reading John Mortimer's *Rumpole of the Bailey*; wakefulness compounded by sunsets at midnight and sunrises at 3:30 AM.

I recall one frustrating afternoon trying to make a Russian coupling and hosing from a 25 psi nitrous oxide tank connect to very unlike attachments of our American air-driven dermatome requiring 80 psi to work. Yet I also remember the charm and grace of a real Russian dinner at the home of Svetlana Astroznikova, hosted by the women surgeons.

Then there was the different beauty and mystery of our Sunday visit to the cathedral and monastery at Zagorsk, one of the major and very active centers of Russian orthodoxy, followed by a riotous Russian picnic in a nameless field of wild flowers under a hot summer sun. Each of these and many more are stories in themselves for another time.

On November 28, 1942 in Boston, the Cocoanut Grove nightclub fire—a disaster of the same magnitude as the Bashkir train-pipeline explosion—killed 491 people and left 181 hospitalized for burns. As a result of Cocoanut Grove, major advances in burn care occurred, principally at the Massachusetts General Hospital and the Boston City Hospital.

Forty-eight years later, our Russian colleagues toasted us. Out of disaster must come progress, and from this disaster came the establishment of The Lenin Soviet Childrens Fund—a non-governmental organization dedicated to improving the lot of children throughout the Soviet Union.

A short time ago, a four-part agreement was signed uniting Childrens Hospital #9, Project HOPE, the Soviet Ministry of Health and the Lenin Fund in a joint five-year effort to build a new 90-bed All Union Childrens Burn Center at the hospital. In addition, this effort will provide the necessary educational, training and consultative help needed to improve the care of those children whose burns are yet to be suffered. We plan to return again to Childrens Hospital #9. □

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Exploring the Dangerous Trades

THE ILLINOIS SURVEY

by Alice Hamilton

It was my experience at Hull-House that aroused my interest in industrial diseases. Living in a working-class quarter, coming in contact with laborers and their wives, I could not fail to hear tales of the dangers that workingmen faced, of cases of carbon-monoxide gassing in the great steel mills, of painters disabled by lead palsy, of pneumonia and rheumatism among the men in the stockyards. Illinois then had no legislation providing compensation for accident or disease caused by occupation. (There is something strange in speaking of "accident and sickness compensation." What could "compensate" anyone for an amputated leg or a paralyzed arm, or even an attack of lead colic, to say nothing of the loss of a husband or son?) There was a striking occurrence about this time in Chicago which brought vividly before me the unprotected, helpless state of workingmen who were held responsible for their own safety.

A group of men were sent out in a tug to one of Chicago's pumping stations in Lake Michigan and left there while the tug returned to shore. A fire broke out on the tiny island and could not be controlled, the men had the choice between burning to death and drowning, and before rescue could arrive most of them were drowned. The contracting company, which employed them, generously paid the funeral expenses, and nobody expected them to do more. Widows and orphans must turn to the County Agent or private charity—that was the accepted way, back in the dark ages of the early twentieth century. William Hard, then a young college graduate living at Northwestern Settlement, wrote of this incident with a fiery pen, contrasting the treatment of the wives and children of these men whose death was caused by negligence with the treatment they would have received in Germany. His article and a copy of Sir Thomas Oliver's *Dangerous Trades*, which came into my hands just then, sent me to the Crerar Library to read everything I could find on the dangers to industrial workers, and what could be done to protect them. But it was all German, or British, Austrian, Dutch, Swiss, even Italian or Spanish—everything but American. In those countries industrial medicine was a recognized branch of the medical sciences; in my own country it did not exist. When I talked to my

From *EXPLORING THE DANGEROUS TRADES* by Alice Hamilton. Copyright © 1943 by Alice Hamilton.



Workers cast grids by hand. Photo taken from "Lead Poisoning in the Manufacture of Storage Batteries," a publication of the U.S. Department of Labor, 1915, by Alice Hamilton.

medical friends about the strange silence on this subject in American medical magazines and textbooks, I gained the impression that here was a subject tainted with Socialism or with feminine sentimentality for the poor. The American Medical Association had never had

workmen were so much better paid, their standard of living was so much higher, and the factories they worked in so much finer in every way than the European, that they did not suffer from the evils to which the poor foreigner was subject. That sort of talk always left me skeptical. It was impossible for me to believe that conditions in Europe could be worse than they were in the Polish section of Chicago, and in many Italian and Irish tenements, or that any workshops could be worse than some of those I had seen in our foreign quarters. And presently I had factual confirmation of my disbelief in the happy lot of the American worker through the reading of John Andrew's manuscript on "phossy jaw" in the match industry in the United States.

Phossy jaw is a very distressing form of industrial disease. It comes from breathing the fumes of white or yellow phosphorous, which gives off fumes at room temperature, or from putting into the mouth food or gum or fingers smeared with phosphorous. Even drinking from a glass which has stood on the workbench is dangerous. The phosphorous penetrates into a defective tooth and down through the roots to the jawbone, killing the tissue cells which then become the prey of suppurative germs from the mouth, and abscesses form. The jaw swells and the pain is intense, for the suppuration is held in by the tight covering of the bone and cannot escape, except through a surgical oper-

ation or through a fistula boring to the surface. Sometimes the abscess forms in the upper jaw and works up into the orbit, causing the loss of an eye. In severe cases one lower jawbone may have to be removed, or an upper jawbone, perhaps both. There are cases on record of men and women who had to live all the rest of their days on liquid food. The scars and contractures left after recovery were terribly disfiguring, and led some women to commit suicide. Here was an industrial disease which could be clearly demonstrated to the most skeptical. Miss Addams told me that when she was in London in the 1880's she went to a mass meeting of protest against phossy jaw and on the platform were a number of pitiful cases, showing their scars and deformities.

All this I had learned, but I had been assured by medical men, who claimed to know, that there was no phossy jaw in the United States because American match factories were so scrupulously clean. Then in 1908 John Andrews came to Hull-House and showed me the report of his investigation of American match factories and his discovery of more than 150 cases of phossy jaw. It seems that in the course of a study of wages of women and children made by the Bureau of Labor, under Carroll Wright, investigators came across cases of phossy jaw in women match workers in the South. This impelled Wright to institute an investigation in other match centers. Andrews was asked to carry it out and did so, with a result most disconcerting to American optimism. Some of the cases he discovered were quite as severe as the worst reported in European literature—the loss of jawbones, of an eye, sometimes death from blood poisoning.

This episode in the history of industrial disease is very characteristic of our American way of dealing with such matters. We learned about phossy jaw almost as soon as Europe did. The first recognized case was described by Lorinser of Vienna in 1845; the first American case was treated in the Massachusetts General Hospital only six years later, in 1851. But while all over continental Europe and England there was eager discussion of this new disease, many cases were reported and all sorts of preventive measures proposed, practically nothing was published in American medical journals from 1851 to 1909, both laymen and public health authorities contenting themselves with the assurance that all was well in our

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a meeting devoted to this subject, and except for a few surgeons attached to large companies operating steel mills, or railways, or coal mines, there were no medical men in Illinois who specialized in the field of industrial medicine.

Everyone with whom I talked assured me that the foreign writings could not apply to American conditions, for our

match industry. When, however, the facts were at last made public in 1909, action was prompt. A safe substitute for white phosphorous had been discovered by a French chemist, the sesquisulphide, the American patent rights for which had been bought by the Diamond Match Company. This company, with rare generosity, waived its patent rights and allowed the free use of sesquisulphide to the whole industry, and this made it possible for Congress to pass the Esch law, which imposed a tax on white-phosphorous matches high enough to cover the difference in cost between them and sesquisulphide matches. So phossy jaw disappeared from American match factories.

There were a few other voices in the wilderness. I remember a trip to Washington, to a medical meeting, when Frederick Hoffman of the Prudential Insurance Company gave us a demonstration, with statistics and charts, of the relation between occupation and tuberculosis. It was a startling eye-opener to me and I feel sure that I was not the only one who was hearing such facts for the first time. Dr. George M. Kober of Washington and Dr. William Gilman Thompson of New York were two other pioneers in this field, and only a few years later Josephine Goldmark published her famous brief on the employment of women in industry. So there were stirrings here and there, the flood was rising slowly.

At the time I am speaking of Professor Charles Henderson was teaching sociology in the University of Chicago. He had been much in Germany and had made a study of German sickness insurance for the working class (the *Krankenkassen*), a system which aroused his admiration and made him eager to have some such provisions made in behalf of American workmen. The first step must be, of course, an inquiry into the extent of our industrial sickness, and he determined to have such an inquiry made in Illinois. Governor Deneen was then in office and Henderson persuaded him to appoint an Occupational Disease Commission, the first time a state had ever undertaken such a survey. Dr. Henderson had some influence in selecting the members and, as he knew of my great interest in the subject, he included me in the group of five physicians who, together with himself, an employer, and two members of the State Labor Department, made up the commission. We had one year only for our work, the year 1910.

We were staggered by the complexity of the problem we faced and we

soon decided to limit our field almost entirely to the occupational poisons, for at least we knew what their action was, while the action of the various kinds of dust, and of temperature extremes and heavy exertion, was only vaguely known at that time. Then we looked for an expert to guide and supervise the study, but none was to be found and so I was asked to do what I could as managing director of the survey, with the help of twenty young assistants, doctors, medical students, and social workers. As I look back on it now, our task was simple compared with the one that a state nowadays faces when it undertakes a similar study. The only poisons we had to cover were lead, arsenic, brass, carbon monoxide, the cyanides, and turpentine. Nowadays, the list involved in a survey of the painters' trade alone is many times as long as that.

But to us it seemed far from a simple task. We could not even discover what were the poisonous occupations in Illinois. The Factory Inspector's office was blissfully ignorant, yet that was the only governmental body concerned with working conditions. There was nothing to do but begin with trades we knew were dangerous and hope that, as we studied them, we would discover others less well known. My field was to be lead, Dr. Emery Hayhurst took brass, Drs. G. Apfelbach and M. Karasek, carbon monoxide in the steel mills. Caisson* disease had appeared in the state, in connection chiefly with the construction of tunnels in Chicago, and Dr. Peter Bassoe undertook the study of the 161 cases of this disease which had occurred up to this date. Dr. George Shambaugh contributed a chapter on boiler makers' deafness and Drs. F. Lane and J. D. Ellis, one on the rhythmic oscillation of the eyes of coal miners, known as nystagmus.

While we were visiting plants, we set our young assistants to reading hospital records, interviewing labor leaders and doctors and apothecaries in working-class quarters, for we must unearth actual instances of poisoning if our study was to be of any value.

* This is a disease caused by work in compressed air when the return to normal air pressure is too quick. The air absorbed by the body under pressure expands if that pressure is released too suddenly and this causes damage, especially in the delicate tissues of the brain and the spinal cord. Violent pain in the limbs (known as "the bends") and brain disturbances (called "the blind staggers") result if the worker goes too quickly into the open air. He is protected now by being made to pass slowly through a series of decompression chambers.

Thus I was put on the trail of new lead trades, some of which I had never thought of—for instance, making freight-car seals, coffin 'trim,' and decalcomania papers for pottery decoration; polishing cut glass; brass founding; wrapping cigars in so-called tinfoil, which is really lead. Hospital records yielded cases from these and from many other jobs which were not mentioned in foreign textbooks.

One case, of colic and double wrist-drop, which was discovered in the Alexian Brothers' Hospital, took me on a pretty chase. The man, a Pole, said he had worked in a sanitary-ware factory, putting enamel on bathtubs. I had

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not come across this work in the English or the German authorities on lead poisoning, and had no idea it was a lead trade, but the factory was easy to reach on the near West Side and I stopped in to ask about the man's work. The management assured me that no lead was used in the coatings and invited me to inspect the workroom, where I found six Polish painters applying an enamel paint to metal bathtubs. So ignorant was I that I accepted this as the work of enameling sanitary ware, and did not even notice that all the men were painting the outsides of the tubs. I did note the name of the paint and went to the factory which produced it, but there I was told that enamel paint is free from lead. Completely puzzled, I made a journey to the Polish quarter to see the palsied man and heard from him that I had not even been in the enameling works, only the one for final touching up. The real one was far out on the Northwest Side. I found it and discovered that enameling means sprinkling a finely ground enamel over a red-hot tub where it melts and flows over the surface. I learned that the air is thick with

enamel dust and that this may be rich in red oxide of lead. A specimen of it which I secured from a workman, who said he often took some home to his wife for scouring pans and knives, proved to contain as much as 20 per cent soluble lead—that is, lead that will pass into solution in the human stomach. Thus I nailed down the fact that sanitary-ware enameling was a dangerous lead trade in the United States, whatever was true of England and Germany.

It was pioneering, exploration of an unknown field. No young doctor nowadays can hope for work as exciting and rewarding. Everything I discovered was new and most of it was really valuable. I knew nothing of manufacturing processes, but I learned them on the spot, and before long every detail of the Old Dutch Process and the Carter Process of white-lead production was familiar to me, also the roasting of red lead and litharge and the smelting of ore and refining of lead scrap. From the first I became convinced that what I must look for was lead dust and lead fumes, that men were poisoned by breathing poisoned air, not by handling their food with unwashed hands. Nowadays that fact has been so strongly established by experimental proof that nobody would think of disputing it. But in 1910 and for many years after, the firm (and comforting) belief of foremen and employers was that if a man was poisoned by lead it was because he did not wash his hands and scrub his nails, although a little intelligent observation would have been enough to show its absurdity.

This fact, that lead poisoning is brought about far more rapidly and intensely by the breathing of lead-laden air than by the swallowing of lead, is of the greatest practical importance. There can be no intelligent control of the lead danger in industry unless it is based on the principle of keeping the air clear from dust and fumes. The English authority, Sir Thomas Legge, after some thirty years' experience in the prevention of industrial disease, reached the conclusion that the air is the only important source of occupational lead poisoning and that the only efficient measures for its prevention are those directed toward the prevention of dust and fumes. A hundred years ago Tanquerel des Planches, who is called the Columbus of lead poisoning, noted that severe plumbism never followed the handling of solid lead but only exposure to dust and "emanations."

Lead is the oldest of the industrial poisons except carbon monoxide, which must have begun to take its toll soon after Prometheus made the gift of fire to man. In Roman days, lead poisoning was known, for Pliny the Elder includes it among the "diseases of slaves," which were potters' and knife grinders' phthisis, lead and mercurial poisoning. Throughout all the centuries since then men have used this valuable metal in many ways, and from time to time an observant physician has seen the results and described them, notably Ramazzini in the eighteenth century, and early in the nineteenth century the great Frenchman, Tanquerel des Planches. It is a

poison which can act in many different ways, some of them so unusual and outside the experience of the ordinary physician that he fails to recognize the cause. I could never feel that I had uncovered all the cases in any community, no matter how small, even after I had talked with all the doctors and gone through the hospital records, for some doctors would not pronounce a case to be due to lead poisoning unless there was either colic or palsy, which is as if he refused to recognize alcoholism unless there were an attack of delirium tremens.

It is true that a severe attack of colic is the most characteristic symp-



Worker mixes lead oxides with no device for removal of the lead dust.

tom of lead poisoning, and palsy—usually in the form of wristdrop—is the one most easily recognized, but there are many other manifestations of this protean malady, as every physician knows today. Thirty years ago it was not hard to find extremely severe forms, such as could come only from an exposure so great as to seem criminal to us now, but which then attracted no attention. Here are four histories, picked at random, from my notes of 1910.

A Bohemian, an enameler of bathtubs, had worked eighteen months at his trade, without apparently becoming poisoned, though his health had suffered. One day, while at the furnace, he fainted away and for four days he lay in coma, then passed into delirium during which it was found that both forearms and both ankles were palsied. He made a partial recovery during the following six months but when he left for his home in Bohemia he was still partly paralyzed.

A Hungarian, thirty-six years old, worked for seven years grinding lead paint. During this time he had three attacks of colic, with vomiting and headache. I saw him in the hospital, a skeleton of a man, looking almost twice his age, his limbs soft and flabby, his muscles wasted. He was extremely emaciated, his color was a dirty grayish yellow, his eyes dull and expressionless. He lay in an apathetic condition, rousing when spoken to and answering rationally but slowly, with often an appreciable delay, then sinking back into apathy.

A Polish laborer worked only three weeks in a very dusty white-lead plant at an unusually dusty emergency job, at the end of which he was sent to the hospital with severe lead colic and palsy of both wrists.

A young Italian, who spoke no English, worked for a month in a white-lead plant but without any idea that the harmless-looking stuff was poisonous. There was a great deal of dust in his work. One day he was seized with an agonizing pain in his head which came on him so suddenly that he fell to the ground. He was sent to the hospital, semiconscious, with convulsive attacks, and was there for two weeks; when he came home, he had a relapse and had to go back to the hospital. Three months later he was still in poor health and could not do a full day's work.

Every article I wrote in those days, every speech I made, is full of pleading for the recognition of lead poisoning as a real and serious medical

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problem. It was easy to present figures demonstrating the contrast between lead work in the United States under conditions of neglect and ignorance, and comparable work in England and Germany, under intelligent control. For instance, when I went to England in 1910 I found that a factory which produced white and red lead, employing ninety men, had not had a case of lead poisoning in five successive years. And I compared it with one in the United States, employing eighty-five men, where the doctor's records showed thirty-five men "lead-ed" in six months.

In 1912, I wrote this in the *Journal of the American Medical Association*:

The contrast was brought vividly home to me by a description which I found in T. Weyl's *Handbuch der Arbeiter-Krankheiten*. He is drawing what he considers a shocking picture of "lead tabes" or "lead cachexia" as it used to be found years ago, but which is now almost never seen, thanks to prophylactic measures. He describes the striking pallor, the hanging head, bowed shoulders, hands that hang limply and can hardly be raised; the shambling gait, trembling movements of all the muscles of the body, the emaciation which is extreme.

From my own experiences I can unfortunately testify to the fact that, thanks to the lack of prophylactic measures, Weyl's lead tabes is far from being a rare condition in our country; that instances of it can be found in every town where there are lead industries of a dangerous character, and that it is not even a vanishing condition, for new instances of lead tabes are being added to the number every year. Surely there is every reason why we should devote to this disease the same intelligence and energy that we devote to other preventable diseases.

Life at Hull-House had accustomed me to going straight to the homes of people about whom I wished to learn something and talking to them in their own surroundings, where they have courage to speak out what is in their minds. They were almost always foreigners, Bulgarians, Serbs, Poles, Italians, Hungarians, who had come to this country in the search for a better life for themselves and their children. Sometimes they thought they had found it, then when sickness struck down the father things grew very black and there were no old friends and neighbors and cousins to fall back on as there had been in the old country. Often it was an agent of a steamship company who had coaxed them over with promises of a land flowing with jobs and high wages. Six hundred Bulgarians had been induced to leave their villages by these super-salesmen, and to come to Chicago. Of course they took the first job they could find and if it proved to be one that weakened and crippled them—well, that was their bad luck!

It sometimes seemed to me that industry was exploiting the finest and best in these men—their love of their children, their sense of family responsibility. I think of an enameler of bathtubs whom I traced to his squalid little cottage. He was a young Slav who used to be so strong he could run up the hill on which his cottage stood and spend all the evening digging in his garden. Now, he told me, he climbed up like an old man and sank exhausted in a chair, he was so weary, and if he tried to hoe or rake he had to give it up. His digestion had failed, he had a foul mouth, he couldn't eat, he had lost much weight. He had had many attacks of colic and the doctor told him if he did not quit he would soon be a wreck. "Why did you keep on," I asked, "when you knew the lead was getting you?" "Well, there were the payments on the house," he said, "and the two kids." The house was a bare, ugly, frame shack, the children were little, underfed things, badly in need of a handkerchief, but for them a man had sacrificed his health and his joy in life. When employers tell me they prefer married men, and encourage their men to have homes of their own, because it makes them so much steadier, I wonder if they have any idea of all that that implies. □

Alice Hamilton 1868-1970 was a pioneer in industrial medicine, and the first woman to hold a faculty appointment at Harvard. The above is excerpted from her autobiography *Exploring the Dangerous Trades*.

Out Sick

TOXINS AT WORK

Occupational and environmental medicine have always been hybrid specialties. They exist at the sometimes uneasy interface between clinical medicine and public health. Occupational and environmental medicine embody such essential elements of clinical medicine as physical examination, diagnosis and treatment. Also, however, they rely heavily on epidemiology, toxicology, industrial engineering and the behavioral sciences for insights into the understanding and the prevention of toxic illness.

by Philip J. Landrigan

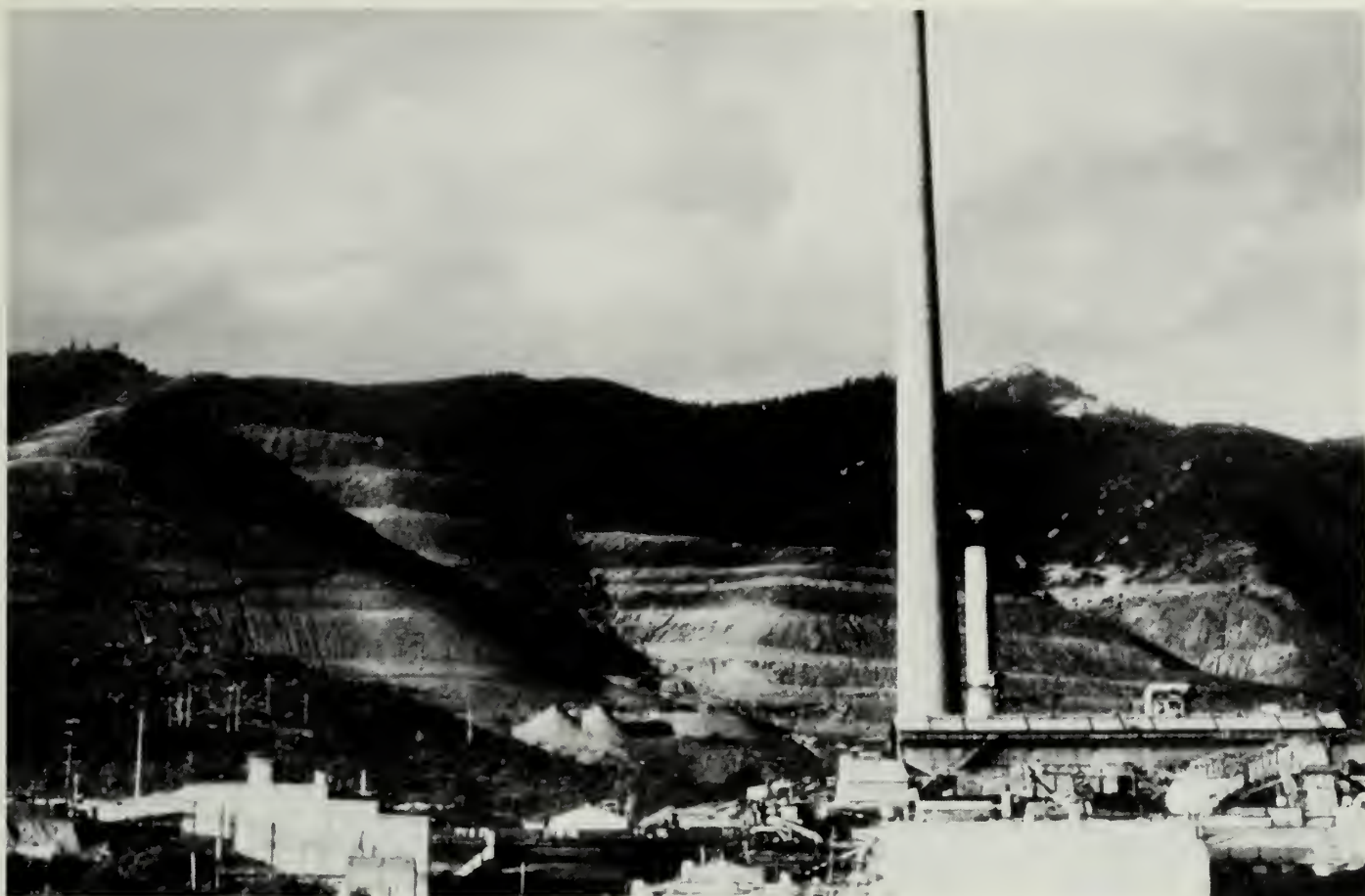
Occupational and environmental medicine are specialties in constant evolution. Each year 1,000 or more new chemical molecules are added to the 60,000 chemicals and the four million mixtures, formulations and blends already in commerce. The toxicity of relatively few of these substances has been adequately evaluated. Consequently, physicians practicing occupational medicine operate frequently at the far edges of recorded toxicologic knowledge. Alert physicians still encounter entirely new disease entities. Indeed, these may be among the last

remaining specialties in which a physician can achieve immortality through eponym.

The scope of occupational and environmental medicine is broad, because the diseases caused by toxic chemical exposures can involve virtually every organ system. Occupational and environmental diseases include lung cancer and mesothelioma in asbestos workers, cancer of the bladder in dye workers, encephalopathy with coma and convulsions in children with lead poisoning, leukemia in workers exposed to benzene, chronic bronchitis in workers exposed to dusts, encephalopathy in workers chronically exposed to solvents, renal impairment in workers exposed to lead, heart disease in workers exposed to carbon monoxide or to carbon disulfide, impairment of reproductive function in men and women exposed to lead and to certain pesticides, and chronic diseases of the musculoskeletal system, such as tenosynovitis and carpal tunnel syndrome, from repetitive trauma.

Occupational exposures have been estimated to cause 100,000 deaths and 400,000 cases of illness each year in the United States.

Below are four case histories, which give a sense of the problems encountered in occupational and environmental medicine in the United States today.



Lead Poisoning in Kellogg, Idaho

In 1974 we conducted clinical and epidemiologic studies of lead poisoning in children who lived near an ore smelter in Kellogg, Idaho. This smelter is located in a narrow, intermountain valley in the panhandle of northern Idaho. Average emissions of lead from the smelter's stacks are estimated to have been 10 tons per month from 1959 through September 1973, when they increased to 35.3 tons per month following a fire in the main filtration unit.

Environmental sampling near this smelter indicated that air lead levels had risen in parallel with smelter emissions from 1971 to 1974. Highest environmental lead levels were immediately at the plant, where the air lead levels were 15 times greater than the EPA maximum standard.

We undertook our epidemiological studies in August 1974 after two siblings, ages two and three years old, were hospitalized with chronic, unex-

plained abdominal pain, maximal blood lead levels of 68 and 89 $\mu\text{g}/\text{dl}$ and "lead lines" in their long bones. (A normal blood level in children was considered then to be 40 $\mu\text{g}/\text{dl}$; today levels as low as 10 to 15 $\mu\text{g}/\text{dl}$ are considered too high.) We analyzed soil and air samples, and interviewed 919 children ages one to nine, grouping them according to how far from the smelter they lived. To evaluate the possible occurrence of subclinical neurologic changes, we conducted studies of neurologic function two months after the conclusion of the epidemiologic studies.

We found that 41.9 percent of the children had blood levels of 40 to 79 $\mu\text{g}/\text{dl}$, and that 4.5 percent had blood lead levels of at least 80 $\mu\text{g}/\text{dl}$. In the area closest to the smelter, all but 2 of 172 children evaluated had lead levels greater than 40 $\mu\text{g}/\text{dl}$, the highest being 164 $\mu\text{g}/\text{dl}$. The prevalence rate for elevated blood lead levels decreased slowly with distance from the smelter. In all

areas, blood lead levels were higher in the one- to four-year-olds than in ages five to nine. There were no clinical cases of lead poisoning.

We concluded from these studies that the ore smelter in Kellogg, Idaho was a major, localized source of environmental contamination, and that this plant had been responsible for widespread, increased absorption of lead by nearby children.

The data from the neurologic evaluations indicated that chronic, increased absorption of lead from the smelter, sufficient to produce blood lead levels of at least 40 $\mu\text{g}/\text{dl}$, was associated with subtle but statistically significant impairment in neurologic and psychologic function in exposed children: IQ scores were reduced, and motor nerve conduction velocity was slowed.

These results are consistent with a large body of data on chronic, low-level lead toxicity that has been generated over the past decade by clinic and epidemiologic evaluations of children and adults exposed to lead. The United States and abroad have increasingly promulgated stringent recommendations concerning reduction of lead exposures.

As the U.S. Environmental Protection Agency has concluded, these studies show in the aggregate that "sur-



prisingly low levels of lead in blood can be associated with the most extreme effects of lead poisoning, including severe, irreversible brain damage," and further that "evidence tends to confirm that some type of neural damage does exist in asymptomatic children and not necessarily only at very high levels of blood lead."

The clear implication of these findings is that lead exposure, particularly of children, ought to be reduced to the lowest level possible. Lead is ubiquitous in our society, and exposure to lead from many sources, even from such a high-dose source as lead-based paint, will be controlled only with great difficulty. There are, however, sources of lead that are readily controllable at the source. Chief among these are lead emissions from automobiles and emissions from the lead industries.

Follow-up studies conducted at smelters demonstrate that lead emissions from these plants can be controlled, and that blood lead levels of nearby children can be reduced. Such a demonstration provides heartening documentation of the economic and technical feasibility of reducing children's exposure to lead through attainment of air lead standards.

Neurotoxicity Beneath the Streets of New York City

In August 1985, a Metropolitan Transit Authority (MTA) employee in New York appeared in the Occupational Medicine Clinic at the Mount Sinai School of Medicine with severe tremors. It was learned that he worked with metallic mercury; he was involved in cleaning arc rectifiers, mercury-filled electrical devices in the subway tunnels, which are used to convert alternating current to direct current. The work involved massive exposure to liquid mercury and to mercury vapor under conditions of seriously inadequate ventilation. On initial evaluation we found that the worker had a highly elevated level of urinary mercury. A diagnosis of mercury poisoning was made.

On follow-up, we found that there were approximately 33 more workers employed by the MTA who were similarly exposed to mercury. We organ-

ized a survey to examine these workers, and we found that 25 (76 percent) of the men in this group had elevated levels of mercury in their blood. Additionally, we found on electrophysiologic testing that those with the longest occupational exposure to mercury had statistically significant alterations in the sensory



thresholds of their peripheral nerves, as compared to those who had been exposed for shorter durations.

We followed this up with inspections of the workplace, performed in collaboration with the management and



the union. On these inspections, we documented worker exposure to mercury under extraordinarily hazardous conditions. On the basis of those findings, we recommended safety precautions, which in the short-term consisted of changes in procedures, and in the long-term meant replacing liquid mer-

cury with solid state rectifiers. In addition, we worked with the MTA and the union to produce a training program and a video on proper safety measures for handling mercury in the workplace.

Since that time, the incidence of mercury poisoning in MTA workers has been substantially reduced.

The clustering and sudden onset of the patients' illness suggested an occupational etiology. Accordingly, a team from the Harvard School of Public Health led by Kathleen Kreiss '74 and David Wegman '66 interviewed all available workers, symptomatic and asymptomatic, and evaluated work practices and plant processes. They found that the only recent change at the plant was a new catalyst, dimethylaminopropionitrile (DMAPN), that had been added to the polyurethane. DMAPN had been introduced on one of the two assembly lines in August 1977 and then used in increasing volumes over a 15-month period.

Data were obtained on 208 of the 230 plant workers, and it was found that the first case of bladder dysfunction had occurred in August 1977, shortly after the introduction of DMAPN. The increase in the number of cases roughly paralleled the increase in use of the catalyst.

The highest incidence of bladder dysfunction occurred in assembly line workers; 63 percent had symptoms. No cases occurred among the 42 nonproduction employees. Five men and three women were referred for detailed neu-

tancy in urination, straining to void, decreased force of urinary stream and increased duration of urination. Several said that they had lost the urge to urinate and voided only once a day or by habit. Others described increased frequency of urination, particularly as their symptoms improved. Some had lost urethral sensation or, as they improved, developed urethral burning.

Bladder Paralysis in Marblehead, Massachusetts

On March 28, 1978 the Board of Health in Marblehead, Massachusetts notified the Massachusetts Department of Public Health that 11 workers, employed in a factory that produced automobile seat cushions from polyurethane foam, had been examined at a local hospital emergency room complaining of urinary difficulties.

The patients complained of hesi-



rologic and urologic evaluation, and seven had abnormalities affecting the distal lower extremities. Electrophysiological abnormalities included sensory

neuropathy, reduced evoked muscle action potentials, slowed sensory nerve conduction, and partial denervation of the anal sphincter.

approximately 4 million American children under age 18 were gainfully employed. Legally employed children include the urban high school student working in a fast food establishment, the suburban 11-year-old delivering newspapers, and the rural child working on a neighbor's farm.

Illegal child labor is also widespread. Four-year-olds "help out" in factory sweatshops passing fabric between their mothers' sewing machines to increase the speed of piecework, while 14-year-olds work on machinery in belt and garment factories, bakeries and butcher shops. Children do industrial homework on school nights, and they pick vegetables in fields still wet with pesticides.

Federal labor laws prohibit most paid work for children under 14 years old to protect them from commercial exploitation and to keep them in school. The Fair Labor Standards Act raised the age limit for full-time work to 16, and set strict limits on how many hours children under 16 can work after school and on weekends.

Under the act, employment in any hazardous nonagricultural occupation is prohibited for anyone less than 18 years old. Therefore, no one under age

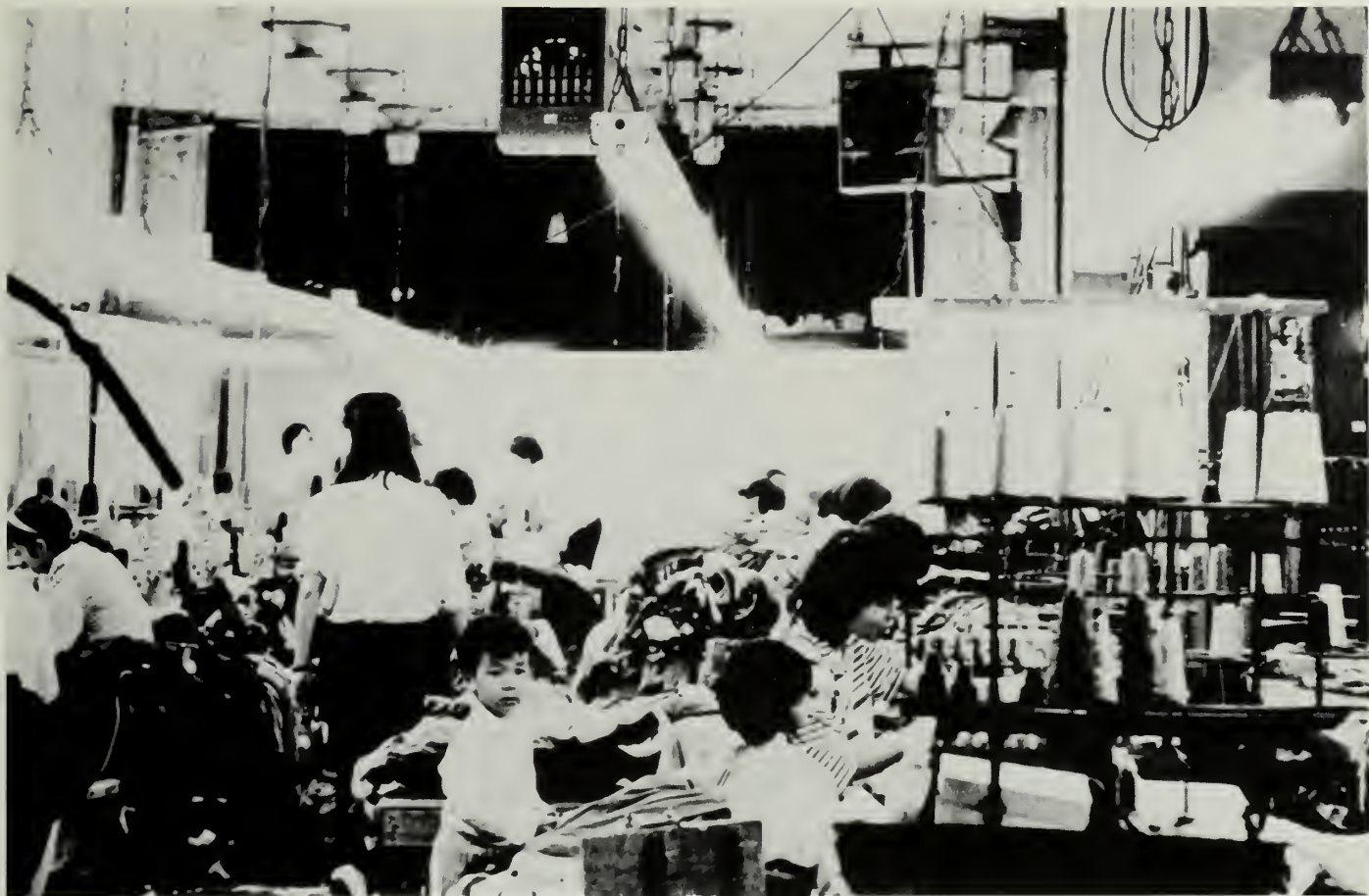
The Resurgence of Child Labor

Most Americans believe sweatshops can be found only in history books, and that child labor is a problem experienced only in Third World countries. However, the harsh reality is that here in the United States, sweatshops (defined as businesses that regularly violate wage laws, child labor laws, and safety and health laws) continue to thrive. Child labor problems not only exist, but they appear to be getting worse.

Nationwide statistics summarized in a recent report from the U.S. General Accounting Office show that there were

150 percent more minors working in violation of the Fair Labor Standards Act in 1989 than in 1983—an increase from about 9,000 children in 1983 to over 22,500 today. This is the highest level of child labor in the United States since the Fair Labor Standards Act was signed into law in 1938. As the workforce shrinks, younger and younger teenagers are being recruited into the workplace, often in direct violation of child labor laws.

Childhood employment is widespread in the United States. In 1988



18 may work in mining, logging, brick and tile manufacturing, roofing or excavating, as a helper on a vehicle or on power-driven machinery. Federal regulations specifically prohibit minors from using meat processing machinery, delicatessen slicers and supermarket box-crushers.

Agricultural employment was exempted from many provisions of the Fair Labor Standards Act. Thus, the employment of children in agriculture remains common and relatively under-regulated. In agriculture, hazardous work is prohibited only until age 16, and all work on family farms is totally exempted.

The health hazards of child labor have only begun to be explored, but the risks of injury, illness and toxic exposure associated with working children appear to be significant. At the Mount Sinai Medical Center, our group has been studying the medical impact of child labor in New York State.

We found that in 1986, the most recent year for which complete information is available, 1,333 workers' compensation awards for work-related injury and illness were made to children under the age of 18 years; 99 of

these awards were to children under the age of 15 years; 541 (41 percent) were for permanent disability, and 6 were for work-related deaths. Reported injuries included chemical burns (12), thermal burns (108), lacerations (436), fractures (238), head injuries (109), amputations (21) and injuries of multiple body parts (87). This is a fearsome toll for children under the age of 18 years. If these statistics are borne out across the nation, then the implications for the health of the children of the United States are very serious indeed.

Anecdotal reports and death certificate information describe injuries to children working on farms, in fast food restaurants and grocery stores, delivering pizzas and newspapers, and working construction. Many children have suffered minor lacerations while others have lost limbs in farm machinery accidents, suffocated in grain silos, sustained burns and been electrocuted in fast food restaurants, had arms amputated in butcher shops, became highway fatalities while delivering pizzas under time pressure, and been crushed in improperly-built construction trench cave-ins. In December 1988, an 11-year-old New York City boy was torn apart and

crushed to death when he became entangled in a box-crusher in a Bronx supermarket.

Looking ahead, the major advance in occupational medicine will be an increasing use of biological markers. Biological markers of exposure to chemical toxins will enable us to determine much more precisely than in the past who has received exposure, and how serious it has been. Simultaneously, with increased application of biological markers of subclinical toxic effects, it will be possible in the future to diagnose occupational diseases before they are manifested clinically, and hopefully before irreversible damage has been done. Then treatment, or at least the arrest of further progression, can supervene. □

Philip J. Landrigan '67 is a pediatrician, epidemiologist and occupational physician. He is the Ethel H. Wise Professor and chairman of the Department of Community Medicine and director of the Division of Environmental and Occupational Medicine at the Mount Sinai School of Medicine in New York City.

FATAL EDGE

Dr. Guillotine and His Non-Invention

by Guillermo C. Sanchez

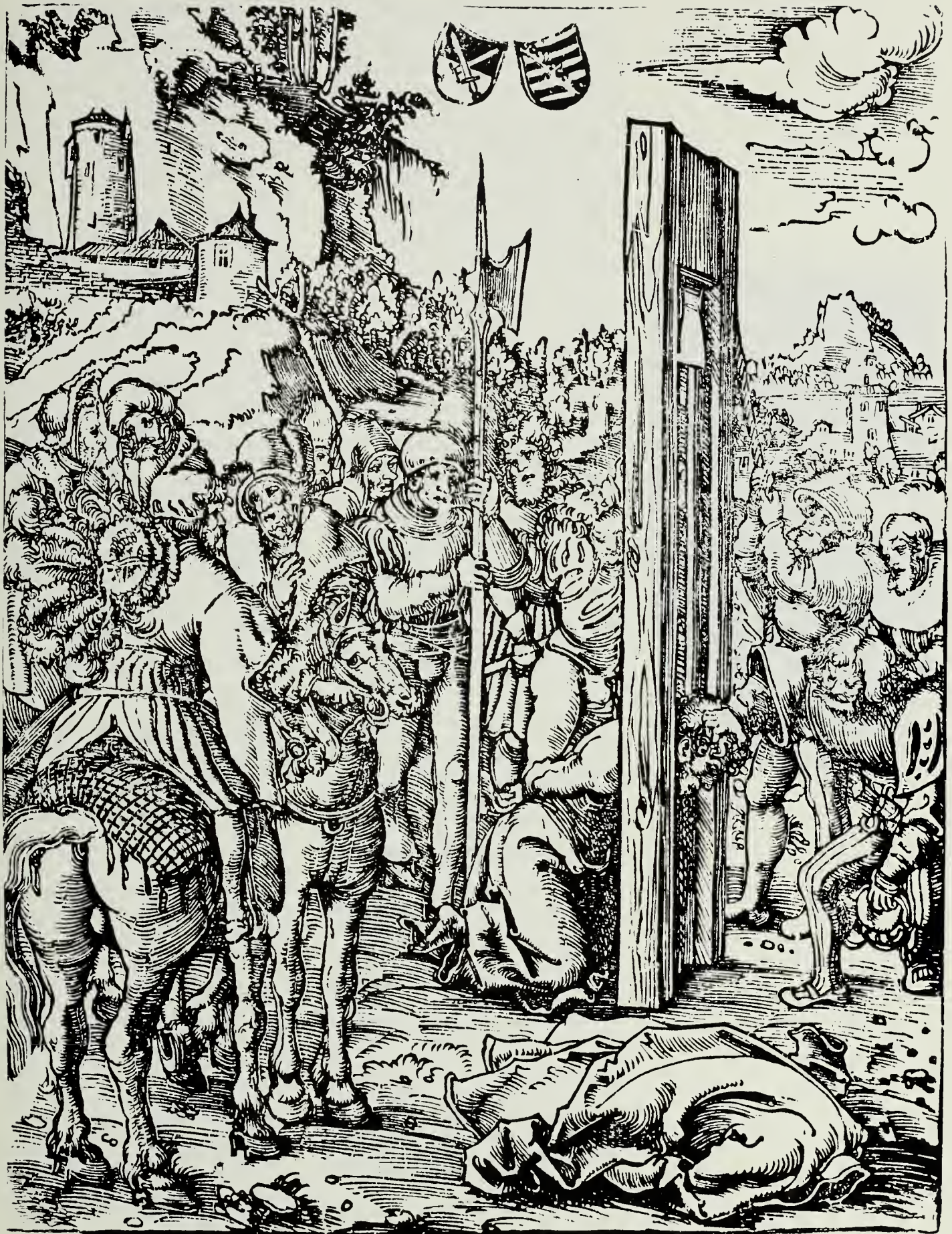
There are some men with bad luck. Christopher Columbus was unable to attach his name to his discovery: Guillotin was never able to detach his from his invention.

—Victor Hugo,
Littérature et Philosophie Mêlées

Who was the man immortalized by the infamous instrument he did not invent but which still bears his name? Joseph-Ignace Guillotin was born in Saintes in 1738, prematurely, according to family lore, when his mother accidentally overheard the shrieks of a dying criminal who was being broken on the wheel.

Guillotin studied with the Jesuits and attained minor orders before being assigned to teach at their Irish College in Bordeaux. Dissatisfied after six or seven years there, he moved to Paris, where he started medical studies under Antoine Petit. A brilliant student, Guillotin soon had a large practice, and he married a young engraver named Elise Saugrun.

German 16th c. woodcut, Martyrdom of the Apostles; St. Matthias, by Lucas Cranach, The Elder; 1472-1553. Courtesy of Fogg Art Museum, Harvard University. Gift of Paul J. Sachs.



The French economy in the 1780s was near bankruptcy, largely due to the enormous expenses incurred in assisting the American War of Independence. Louis XVI, unable to raise enough funds by the usual taxes, was forced to convene the Estates General. This body, which had not met since 1614, consisted of representative groups of the aristocracy, the clergy, and a much smaller group, the "Third Estate," representing the rest of the population.

Guillotin, newly interested in politics, composed and circulated a pamphlet entitled "Petition of the Citizens of Paris," which urged the king to appoint as many representatives of the merchants and artisans of France to the Third Estate as the joint number of clergy and aristocracy. The petition also requested that the principle of one-man-one-vote prevail in the Estates General.

The petition gained many signatures, and the government recognized the threat such a suggestion created. Guillotin was tried by parliament, the city government of Paris, and ordered to withdraw all available copies of the petition. It was informally suggested, however, that Guillotin's basic argument might be sound, and before long it was agreed to. When Guillotin was freed instead of being imprisoned after his trial, he was met by a frenzied mob that carried him in triumph through the streets. When elections were held, he was one of the leaders sent to represent the Third Estate by his Paris constituents.

His reputation increased further when he authored some of the most important *Cahiers de Doléances*, or notebooks of complaints, in which each of the three estates put before the king their particular concerns. Guillotin was also commissioned to make whatever architectural improvements were needed in the hall in the Tuileries where the Constitutional Assembly met, and it was due to him that appropriate ventilation and sanitary facilities were introduced.

Before the French Revolution, major social distinctions were reflected in the way capital punishment was applied. Apart from Germany, where all women criminals were beheaded, decapitation in Europe was reserved for aristocrats. Common criminals were killed in horrendous fashion: drawn and quartered, broken on the wheel, burned at the stake or simply chopped to pieces. It was also customary to punish the criminal's family by publicizing the relationship and stripping them of all their possessions.

In the newly organized Constitutional Assembly, Guillotin and others

persuasively argued that execution for major crimes should be carried out in a democratic fashion, with decapitation being the method of choice, and with no stigma attached to surviving relatives. Guillotin proposed that this be accomplished with a "simple mechanism," and was quoted as saying: "Now, with my machine, I strike off your head in the twinkling of an eye and you never feel it." Laughter terminated such debates.

Not surprisingly, a royalist journal, *The Acts of the Apostles*, gleefully published a series of poems entitled "On the Inimitable Machine of Dr. Guillotin Suitable to Cut Heads and Named from His Name Guillotine." Thereafter the good doctor was never able to separate his name from the fatal instrument.

It was rumored that Guillotin had conceived of it after watching a marionette show in which the villain had his head severed with some type of machine. The truth, however, is more complicated.

Was it a new concept? Far from it. In the 19th century, a large stone axe weighing several hundred pounds was uncovered in France and some scholars speculated that it had been used for executions in prehistoric days. No specific facts document such a theory, however. The French attributed the earliest instruments of decapitation to the Chinese, but again, no known facts confirm this. Anecdotal references to decapitating machines date back to the time of the Romans and possibly even the Spartans.

Illustrative documentation of a decapitation machine exists in a series of prints from the 15th and 16th centuries. The oldest of these is the 1498 Neapolitan print entitled "The Execution of G.F. Petrucci" in the Morgan Library's collection in New York. Another print from 1519 by Peter de Natabus shows the martyrdom of St. Pancratus with a similar machine. The best known and the most artistic is "The Martyrdom of St. Matthew" by Lucas Cranach the Elder, done before 1553.

We know that in England, in a small region around Halifax, the "Halifax Gibbet," a device very similar to the guillotine, was used to execute James, Duke of Morton. In Scotland, at least in the 17th century, a similar, very modern-looking machine was employed. It was known locally as "The Maiden," in contrast to the gallows, which was called "The Widow," both in Scotland and France. Finally, the Italians employed a comparable instrument, called "Mannaya" or "Mannaia," for at least a century or more.



Bust of Joseph-Ignace Guillotin from *La Guillotine . . . Pendant La Révolution* by G. Lenotre. Courtesy of Widener Library, Harvard University.

Guillotin's proposal to reform the penal code by making decapitation the only acceptable method of execution, "regardless of the person's rank or state," was passed by the assembly in January 1790. Some discussion ensued as to the method to be employed, and the royal executioner, Sanson, was consulted.

Sanson gave his written opinion that the traditional method of beheading by the sword would be totally impossible if it were contemplated for large numbers. A sword kept its edge for only two beheadings, he said, and furthermore, was suitable only when the victim was a gentleman who could be counted on to cooperate. A struggling commoner would make the method totally impossible and likely very messy.

Interestingly, in the years preceding the French Revolution, not only Guillotin but even Marat and Robespierre had expressed themselves as fundamentally opposed to capital punishment. This is particularly ironic in view of the enthusiasm with which the latter two disposed of their foes, and of many other innocents, with no further qualms.

Most of the men involved in the conception and development of the guillotine were similarly uninterested in its bloody possibilities. They wished to make executions swift and painless and to avoid the clumsy horrors that sometimes led the angry and disgusted crowds to attack the executioner and his assistants.

Once the assembly agreed that some new method had to be devised, Antoine Louis was consulted. Louis was an Alsatian military surgeon and the elected perpetual secretary of the Academy of Surgery. He was known for his writings on the theory of electricity, an "Essay on the Nature of the Soul," and for six letters on the certain signs of death, written to counteract the terror of those who feared being buried alive by mistake.

Alexander Dumas claims that during the research on the ideal form of the guillotine, Louis XVI—who was a talented mechanic and locksmith—asked to see the sketches of the proposed machine. He was said to have suggested that the blade be angled instead of horizontal, in order to produce its effect by cutting rather than crushing. Ironically, less than three years later the efficacy of this suggestion was proven on his royal self.

Louis XVI would not be the only participant in the development of the guillotine who would also die by it. Roland, the Minister of the Interior, who signed the decree into law, lost his wife to the device, and the same fate

befell the assemblymen who guided the decree through the detailed discussions in the assembly—Danton and Robespierre.

Once the design had been agreed on, the authorities approached the carpenter Guedon, who was the traditional manufacturer of gallows. He demanded an outrageous price for each instrument, believing that those who manufactured them would think their labors so demeaning that they would demand unusually high wages. Since this proposal was financially unacceptable, Louis approached a fellow Alsatian, Tobias Schmidt, a carpenter who specialized in the manufacture of harpsichords.

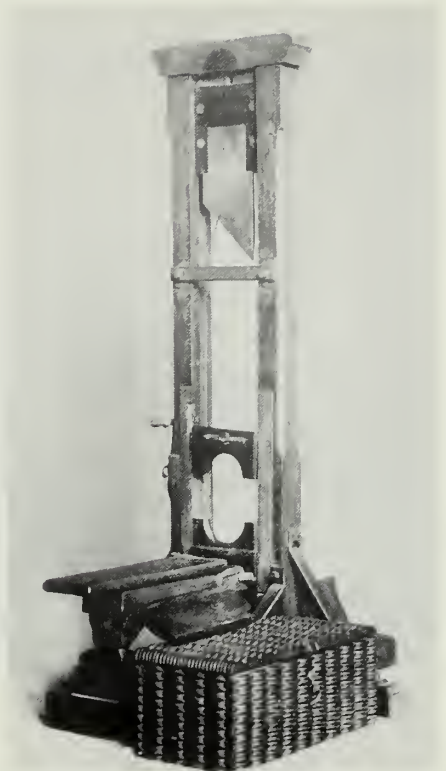
Schmidt was willing to carry out the task for a much smaller amount. He still became a very wealthy man, since he supplied all the guillotines required by the departments, and at least two at any given time for Paris itself. (It is said that he died a pauper, however, because in his dotage he fell madly in love with a young dancer, a protégée of Napoleon's step-son, and his lavish gifts to her ruined him financially.)

It is worth noting that, in spite of its dreadful reputation, the guillotine probably did help control the number of executions. After several hundred people were lynched in one month alone—September 1792—the guillotine was almost exclusively the method of execution employed in Paris from 1792 to 1794, when approximately 2,700 victims lost their heads.

In contrast, in the provinces, where there was less concern about public image and public relations, it is estimated that 500,000 to 600,000 people were executed, excluding soldiers fighting foreign armies. In Lyon, people were killed by cannon volleys, and in the Loire region, they were placed on large barges, which were then sunk in the river.

The guillotine was not immediately put into use after its development. Louis—being a good scientist after all—tested it initially on a few sheep, and then conducted a final experiment, attended by Guillotin and Sanson, in which two corpses were used. In the beginning the machine was known as "Louissette" or "Louison" in recognition of Louis's role, but those names never stuck.

The first official execution was that of a bandit, in April 1792. The second, one of the first political victims, occurred nearly four months later. Then the tempo quickened. At its peak, the Paris executioner did away with 58 victims in 35 minutes.



An old guillotine, housed in the Carnavalet Museum in France.



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